

CHISHOLM'S HANDBOOK OF COMMERCIAL GEOGRAPHY

ENTIRELY RE-WRITTEN BY

L. DUDLEY STAMP

C.B.E., D.Lit., D.Sc.

PROFESSOR OF SOCIAL GEOGRAPHY IN THE
UNIVERSITY OF LONDON

AND

S. CARTER GILMOUR

FOURTEENTH EDITION

WITH MAPS AND DIAGRAMS

LONGMANS, GREEN AND CO
LONDON · NEW YORK · TORONTO

6 & 7 CLIFFORD STREET LONDON W1
 ALSO AT MELBOURNE AND CAPE TOWN
 LONGMANS, GREEN AND CO INC
 55 FIFTH AVENUE NEW YORK 3
 LONGMANS, GREEN AND CO.
 215 VICTORIA STREET TORONTO, 1
 ORIENT LONGMANS LTD
 BOMBAY CALCUTTA MADRAS

BIBLIOGRAPHICAL NOTE

A HANDBOOK OF COMMERCIAL GEOGRAPHY
 BY GEO. G. CHISHOLM

First Edition August 1889
Second Edition May 1890
Third Edition May 1892
Reprinted:
 January 1894, October 1896, May 1899, June 1900,
 March 1901, April 1902
Fourth Edition 1903
Fifth Edition 1904
Sixth Edition 1906
Seventh Edition 1908
Eighth Edition March 1911
New Impressions:
 July 1913, September 1914, June 1915, June 1916,
 January 1918, January 1919, and February 1920
Ninth Edition May 1922
Tenth Edition January 1925

REVISED AND EDITED BY L. DUDLEY STAMP

Eleventh Edition January 1928
Twelfth Edition February 1932

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Thirteenth Edition 1937
Fourteenth Edition (L. D. Stamp and S. C. Gilmour) . 1954

PRINTED IN GREAT BRITAIN
 BY WESTERN PRINTING SERVICES LTD., BRISTOL

PREFACE TO THE 14TH EDITION

CHISHOLM'S HANDBOOK OF COMMERCIAL GEOGRAPHY was first published in August 1889. In his Preface to the first edition the author states that he has endeavoured to impart an 'intellectual interest to the study of the geographical facts relating to commerce,' and he refers to the address given by Mr. Goschen on his installation as Lord Rector of Aberdeen University in 1887, in which was stressed the importance of such intellectual interest with a view to success in business. The author states that he intends the work for three classes of persons, 'first, teachers who may wish to impart additional zest to their lessons in geography from the point of view of commerce; secondly, pupils in the higher schools and colleges that are now devoting increased attention to commercial education; and thirdly, those entering a commercial life, who take a sufficiently intelligent interest in their business to make their private studies bear on their daily pursuits.'

It is a remarkable tribute to the foresight of Chisholm that he judged aright; for each of these three classes his book became a standard work and may justly be claimed a classic. Yet he wrote at a time when the University study of the subject was virtually unknown and when the school teaching of geography comprised mainly a wearisome repetition of lists of capes and bays, towns and products. In the course of thirty-six years after the first edition he supervised no fewer than twenty-three new editions and reprints, and the book underwent a process of steady growth and evolution. The huge task of incorporating the changes occasioned by the First World War fell to him in his declining years, and after the appearance of the tenth edition in January 1925 he felt he could do no more. The remarkable vitality of the work led the publishers, with the author's agreement, to ask me in the autumn of 1926 to undertake a new revision. The eleventh edition accordingly appeared in 1928, and it was clear that the author derived keen pleasure from the fact that his child had found a foster-parent. It was intended that the next edition should be recast into almost a new work, but it was needed so urgently that another revision (the twelfth edition) appeared in 1932.

I then undertook the virtual re-writing of the whole from beginning to end, though I endeavoured to retain as much as possible of the old Chisholm. Much can be learnt from the history of commercial development, and it is for that reason that the text will be found to include considerable sections of historical material and it is hoped thereby to counteract any tendency to facile correlations based only on the present position.

The re-written Chisholm—which may be regarded either as a new work or as the thirteenth edition—appeared in 1937, less than two years before the outbreak of the Second World War. Again it became out of date, yet revision in the turmoil of war and its aftermath seemed impossible, and the book was allowed to go out of print. In 1949 another rewriting was begun and proved an enormous task. I secured more than the help of Mr. S. C. Gilmour: he has become the author of much that follows and no one has ever had a more painstaking and thorough collaborator. His long and varied experience of editorial work, his unrivalled knowledge of sources, and his personal contacts with experts in many lands have all proved invaluable. We both hope that we shall continue to receive those comments from readers which have proved so valuable in the past.

L. D. S.

LONDON SCHOOL OF ECONOMICS,
W.C.2,
November 1953.

GEORGE GOUDIE CHISHOLM

M.A., B.Sc. (EDINBURGH), HON. LL.D. (EDINBURGH)

1850-1930

THE first forty-five years of his life George G. Chisholm spent in his native land of Scotland, labouring almost alone to build up a reputation for Geography. The subject had scarcely emerged from the eclipse which it suffered when the broad-minded philosophy of the cosmographers of the Middle Ages had passed into that petty collection of dull facts regarded as geography in the nineteenth century. It was characteristic of a man to whom 'inaccuracy was anathema' that he sought by the quality of precision to enhance the reputation of his subject. His early years were years of preparation, 'he never spared labour, and his unseen toil supplied much of the material on which others built more easily-earned reputations.' Thus Chisholm had reached his thirty-ninth year when his 'Handbook' was first published, and his forty-fifth when Longmans' *Gazetteer of the World* with its innumerable original references finally established his reputation. In the same year—1895—he left Scotland for thirteen years in London and became one of a line of distinguished geographers who have done much to advance this subject from Birkbeck College. In 1908 he became the first Lecturer in Geography in the University of Edinburgh, securing thus the first recognition of geography in that University. He then began to wield a great influence—as a lecturer to future teachers, later (though not till 1919) to B.Com. students and to those who sought the new post-graduate Diploma in Geography; as Secretary to the Royal Scottish Geographical Society and as Examiner to such bodies as the Institute of Bankers. In 1921 his work was recognised by the change of his post to that of Reader. Two years later, at the age of 73, he retired and received the highest academic honour the University could bestow—the Honorary LL.D.

Retirement allowed him to complete the belated post-war edition of his 'Handbook,' and it was not until later that I had the privilege of enjoying his personal friendship. He and his wife formed the habit then of coming south to enjoy the milder winter at Bournemouth, and it was the privilege of my wife and myself to

join them in a little dinner in a quiet London hotel on the occasion of his seventy-ninth birthday. In his unhurried, precise way he expressed his approval of the new edition of the 'Handbook' I had recently edited, and it was on that occasion that I promised, so far as lay in my power, that the work which had exercised so much influence on the progress of geography should not be forgotten by the English-speaking world. In less than a year Chisholm had passed away—in full possession of his faculties—suddenly—and but a few moments after the consultation of some work of reference in his well-stocked library in Edinburgh.

This book is dedicated to the memory of a master, the results of whose pioneer work we all enjoy. Its appearance is in fulfilment of a promise made to that master himself.

L. D. S.

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HANDBOOK OF COMMERCIAL GEOGRAPHY

INTRODUCTION

The great geographical fact on which commerce depends is that different parts of the world yield different products, or furnish the same products under unequally favourable conditions. Hence there are two great results of commerce: the first, to increase the variety of commodities at any particular place; the second, to equalise more or less, according to the facilities for transport, the opportunities for obtaining any particular commodity in different places between which commerce is carried on. Among the difficulties of transport to be overcome we here include all the profits necessarily levied in the transference of goods from hand to hand (profits of exchange).

The variety of products in different places is due either to artificial production, whether by cultivation or manufacture, or to original distribution. The original distribution of minerals of economic value is an important matter for consideration in commercial geography, but under this head we must consider, not merely the latitude and longitude of the place of occurrence, but all the varied conditions, local, political, or historical, which help to render mineral deposits commercially available. Original distribution under the same provisos is likewise the prime consideration in the case of forest products, where the forests have not been planted by the hand of man.

In the case of cultivated products, soil and climate are considerations of first importance in determining the variety obtaining at different places. But even with reference to such products these are not the sole considerations. Facilities for finding a market, and all the conditions that affect these facilities, have also to be taken into account.

The cost, in labour, of bringing goods from one part of the world to another has been greatly reduced since the time of the earliest

commerce of which we can get a glimpse. On the whole, there has been a gradual development of the means of transport; but the rate of development has been very unequal in different regions and at different times, and in our own age it has attained the highest pitch yet reached. As this development has proceeded, the variety of products entering into commerce and obtainable at particular places has constantly increased. In the earliest periods the articles in which commerce was developed on a great scale, involving the longest and costliest journeys, were necessarily such as were of great value in proportion to their bulk. Such commerce supplied chiefly the luxuries of the rich, and commodities on which a high value was conferred by religion. Records of early Egyptian, Assyrian, and Phœnician trade speak of gold, silver, and precious stones, ebony and fine woods, ivory and inlaid work, incense and perfumes, balsams and gums, apes, peacocks, panther-skins, and slaves as the principal gifts of commerce. Indian dyes (indigo) appear to have reached Egypt in the time of the eighteenth dynasty (1700–1475 B.C.); Baltic amber was probably brought to Assyria in the time of Tiglath-Pileser II (eighth century B.C.); and Chinese silks are known to have reached the Indus through Afghanistan in the fourth century B.C., though probably without anything being known in the country where the goods were bought of the country in which they originated. The silks were no doubt gradually transferred from tribe to tribe on the route, and in this manner they are likely to have occasionally reached the West at a much earlier date.

The trade in bulky articles such as grain brought from a distance was necessarily confined to regions easily brought into communication with one another by good water carriage. From an early period in Greek history the necessity for this trade gave peculiar importance to the grain-growing regions on the northern shores of the Black Sea. Rome at the height of its prosperity first made Sicily a granary for central Italy during the later period of the Republic, and under the Empire grain was likewise obtained from Egypt and Cilicia, Mauretania, and Spain. Sea carriage within the Mediterranean rendered all these sources of supply easy of access; but where distant land carriage was added, especially for the material of an artistic product, the prices demanded were such as only the wealthiest could pay. Varro, in the first century B.C., mentions citron-wood along with gold as among the costliest luxuries at Rome, and about the same date as much as 1,400,000 sesterces (£10,500) was paid for Alexandrian tables made of thya-wood (the wood of *Callitris quadrivalvis*) with ivory feet.

Coming down to the most flourishing period of the trade of Italy with the East, that is, towards the close of the fifteenth century, just before the discovery of the sea-way thither, we find that the principal articles of commerce were silk, silk-stuffs and other costly

manufactures, spices and drugs. At Antwerp in 1560, after the seaway to the East had been fully established, and that city had attained the summit of its maritime and commercial prosperity, though the goods that were dealt in included leather, flax, tallow, salt fish, timber, corn and pulse, and other articles of general consumption, there was a remarkable choice of costlier articles, such as wrought silks and velvets, cloth of gold and silver, tapestries, dimities of fine sorts, jewels and pearls, dyes and perfumes, drugs and spices.

In Shakespeare's time we know from Shakespeare himself that sugar, currants and dates, rice, mace, nutmegs and ginger, as well as civet and 'medicinable gum,' were all familiar in England, while the manufactured products of the time comprised, among others,

Fine linen, Turkey cushions boss'd with pearl,
Valance of Venice gold in needle-work.

Tobacco, though not mentioned by Shakespeare, was already in use in England. Of the articles mentioned, however, some that are now within the reach of everyone must have been, at the period referred to, comparatively rare luxuries. Without going beyond Shakespeare we get a hint that rice was dear. 'What will this sister of mine do with rice? But my father hath made her mistress of the feast, and she lays it on.' From other sources we learn the cost of some of the other tropical products mentioned. In 1589 a quarter of an ounce of tobacco cost in England 10d., 1 lb. of sugar 20d.; and the difference in money value between then and now gives an inadequate idea of the actual difference in cost, for we find from the same source that a pound of sugar then cost (at least in the country) as much as a quarter (28 lb.) of veal or mutton.

The contrast between Shakespeare's day and our own is striking in many ways. Tea, coffee, and cocoa, besides other minor but still familiar articles, such as sago and tapioca, have all been added, along with a host of others, to the list of mercantile commodities. The price of tropical products has been so reduced that, for example, tea, sugar, coffee, cocoa, and tobacco are all in common use even in the Arctic homes of the Laplanders. In the trade of the world almost universally the articles of greatest aggregate value have come to be the natural products, raw materials, and manufactured articles in most general use—wheat and rice, meat, bacon and hams, butter and cheese, cotton and cottons, wool and woollens, iron and ironware, besides rubber and rubber goods, &c. Even in the export trade of India spices other than pepper have fallen very low in the list, and the principal commodities exported are mostly bulky raw or semi-manufactured commodities. One drug only, opium, continued till the twentieth century to take a leading place among the exports, and this would have been of comparatively small importance had it not been for one great market (China).

We thus see that the increasing variety of commodities entering into commerce is in a great measure an increase in the commoner articles of consumption. To get an idea of the extent of the variety that has been attained through the gigantic and complicated commerce of the present day, there is no better method than to examine the price-list of one of the great department stores or miscellaneous retail shops now so common.

The equalising tendency of commerce has already been incidentally illustrated by the reduction in price of tropical commodities just mentioned; but this tendency needs a little further elucidation.

The tendency may be described, first, as one towards equality of prices from year to year—in other words, to stability of prices; a tendency manifested most conspicuously in the case of those commodities the supply of which in any particular region, apart from commerce, is largely dependent on the weather. Between 1641 and 1741 the price of wheat per quarter (8 bushels) in England oscillated between 23s. and 76s.; in the period from 1741 to 1841, between 22s. and 129s., the highest prices being reached during the period of the Napoleonic wars; in the period 1842 to 1883 the limits of oscillation were only 39s. and 75s., the latter figure being reached only during the Crimean war. The early years of the present century again saw very low prices with the abundance of supply from the new lands. The world pattern which had been developing for so long was rudely upset by the outbreak of the First World War in 1914. Though the inter-war period of 1918 to 1939 saw a resumption of extended world trade, the outbreak of the Second World War witnessed the beginning of many far-reaching changes. The changing value of currencies in many countries—indeed in all, including the dollar and the pound—makes direct comparison with the past impossible. Instead of the free functioning of exchange rates currencies are now managed and controlled. The operation of free trade has been replaced by a complicated system of bulk buying by governments and prices rendered artificial by subsidies and in other ways. That part of the world dominated by Soviet Russia—constituting the lands behind the 'Iron Curtain'—is largely isolated from the rest of the world. In some ways countries tied to the United States dollar are divided from the countries of the sterling group. So the tendencies discussed in the following paragraphs are largely obscured.

In a free-trade world, excessive prices in one region are kept down by supplies sent from other regions where the commodity is cheap, and the sending away of the surplus from these latter regions tends to raise the price in them. The effect of this nature attributable to commerce is best recognised by observing the conditions that prevail in places where communications are very imperfect and commerce consequently limited. Thus, in 1885, when Quito, a town

in the Andes at the height of nearly 10,000 feet above sea-level, could be reached from Guayaquil, the principal port on the coast, only by means of pack-animals, which had to travel a distance of 320 miles, local produce was exceptionally cheap, but imported articles were excessively dear. Beef sold at from 2*d.* to 2½*d.* a pound, mutton 1½*d.* to 2*d.*, chickens 6*d.* to 7½*d.* apiece; ordinary labourers received about 6*d.* a day; carpenters, stonemasons, and other artisans about 1*s.*, finding their own food. On the other hand, dry goods, hardware, common cutlery, crockery, and imported furniture were from 25 to 50 per cent. higher than in foreign markets; and common ironware cost fully twice as much as in the countries from which it was brought. So also in the hills of the Upper Chindwin district in Burma, a thousand miles from Rangoon, the writer found as recently as 1925 that three chickens could be bought for 1*s.* 4*d.*, but the same sum was freely offered by the local inhabitants for an empty wine bottle.

As already noted, while the tendency of commerce is towards comparative steadiness in prices, yet the level towards which the price tends is not the lowest level in any place of production. Merchants sell abroad because they can thus get a better price than at home. It is their quest after higher prices that reduces the inequality under this head in different parts of the world. To them the advantage of an extended commerce is this, that the wider the commerce the greater is their choice of customers.

Hence there follows a third great result of the growth of commerce, namely, the development of the resources of different regions to the utmost extent possible under the existing conditions, whatever these may be, and with this development the keenest and most widespread competition, which is, indeed, only another aspect of the same great fact.

But in process of this development it becomes apparent that the equalising tendency of commerce is only a general tendency, which is apt to be masked now and again by disturbances, by great variations in price, due directly or indirectly to the operations of commerce itself. These disturbances may arise from inventions causing a sudden cheapening in the processes of production, such as the great textile inventions or those which gave rise to the modern methods of steel-making; they may arise from the introduction of cheaper means of transport, and the disturbance due to this cause is felt all the more keenly when the cheaper transport is to regions in which there is exceptionally cheap labour or cheap land, and still more when it leads to the rapid settlement of land of unused and extraordinary fertility; or they may arise from a vast and rapid expansion of the demand for some commodity—an expansion such as is only possible since commerce has come to be pursued on the extensive scale characteristic of the present time.

Such disturbances are sure to inflict hardship somewhere. The transition from domestic industry in spinning and weaving to the factory system is too far in the past in our own country for the attendant hardships of that transition to be remembered, or even generally known; but these hardships are still being felt in some parts of the world, as in India, Indo-China, and China. In India we have, first of all, seen hand-spinners and weavers considerably impoverished by the commerce in English machine-made cottons, and subsequently a vigorous competition with our own cottons in the East arising from the development of a local mechanical textile industry. As already mentioned above, other causes of disturbance to trade have been seen during the present century in the World Wars and the political and economic upheavals that came in their train, leading to the multiplication of tariff barriers and government controls, all designed to interfere with the natural flow of trade.

The disturbance that may be caused by the rapid expansion of the demand for a commodity is seen in the history of the iron trade after 1870, as reflected in the price of pig-iron 'warrants'—*i.e.*, forms of receipt for warehoused goods, the title to which can be transferred by assignment. The average price of these warrants at Glasgow in the years 1869 to 1871 varied between about 53s. and 59s. per ton; in 1872 the average rose to about 102s., in 1873 to 117s., after which it fell steadily to about 54s. in 1877. The sudden rise was due to the fact that, vast as our own commerce and industry had already become in 1872, it was not yet equal to the demands that were then made on it for the further expansion of commerce by the laying of numerous railways, and the establishment of numerous factories in America and Germany. The annual increase of railway mileage in America rose steadily from 1,177 miles in 1865 to 7,379 miles in 1871. The annual exports of iron and steel from the United Kingdom to the United States increased steadily from 186,000 tons in 1865 to 1,064,000 tons in 1871; those to Germany, Holland, and Belgium increased year by year from 255,000 tons in 1866 to 1,015,000 tons in 1872. But in the subsequent course of iron prices the general equalising tendency of commerce can still be detected. The vast demand of 1871 to 1873 led almost immediately to such an increase in the means of producing iron that, when the next great expansion of the demand came about, it was met with greater ease. From 1877 to 1887 the extreme variations in average annual price of pig-iron warrants at Glasgow were only about 40s. and 54s. 6d.

Inevitable as the hardships attendant on such disturbances are, the improvements that bring about such incidental results are of value to the world in the long run, in so far as they afford the means of permanently lightening human labour in the production and distribution of the means of satisfying human wants. That they do

so for an ever-increasing proportion of the inhabitants of the world would appear to follow from the fact to which attention has already been drawn, the increasing proportion of the necessities of life and the articles of most general consumption entering into the aggregate commerce of the world. The large and quick steamers, the numberless railway trains, in short all the vast apparatus that now stands at the service of commerce, can be kept working only by transporting commodities consumed in the largest quantity, such therefore as satisfy the wants of the multitude. Between the two World Wars invention succeeded invention so rapidly that changes were almost continuous, and the nations were facing such problems as permanent unemployment. The late Lord Stamp, in his Presidential Address to the British Association in Blackpool in 1936, dealt with this question of the impact of science on society.

The full advantage of any permanent benefit to mankind from the developments of which we are now speaking is not reaped until every kind of production is carried on in the place that has the greatest natural advantages for the supply of a particular market. By natural advantages are meant such as these—a favourable soil and climate, the existence of facilities for communication external and internal so far as these lie in the nature of the surface and physical features, the existence of valuable minerals in favourable situations, and especially of the materials for making and driving machinery, these being among the products which are least able to bear the cost of carriage. All these advantages are more or less permanent, or at least such as are exhaustible are for the most part liable to exhaustion only by slow degrees. Unfortunately, the nations of the world are showing signs of ignoring this simple truth and are seeking to build up behind tariff walls industries which are not suited to the localities concerned and for which there are no natural advantages.

With natural advantages may be contrasted historical advantages, which are in their nature more temporary, though they are often in fact of long continuance. Perhaps the most important of all is a strong and stable government based on just and fixed principles not hostile to industry; and this, it may be observed, is one of those which may be very enduring in fact, as the disadvantage arising from the want of that condition is very apt to be.

Inasmuch as some advantages for commerce and industry are thus temporary in their nature, it is necessarily more or less perilous for a country to have its commercial and industrial prosperity based chiefly on advantages of this kind; and there are numberless examples in history to show the hardship and disaster that may result from the withdrawal of the advantages on which a temporary superiority was based. We may refer in illustration of this to the losses that

East, the prosperity of that commerce being based in a large measure on the central position of Italy—a position which was permanent only so long as the geography of the world was imperfectly known. It is specially disadvantageous for any country when the temporary prosperity of any of its chief industries is based on a circumstance that must in itself be regarded as disadvantageous—such, for example, as low wages.

With reference to the temporary character of certain advantages for commerce and industry, it is likewise a fact of the greatest moment that, viewed broadly, the commerce and industry of the world have for more than a hundred years been in a transition stage the like of which has never been known before. Communications are being improved, the means of production are being accelerated and cheapened, uncultivated lands are being settled, and primitive peoples introduced to the inventions of the white races with a rapidity hitherto unparalleled—with incidental results, as we have seen, not always the most desirable. Commerce and industry thus tend to be governed more and more by geographical conditions, which accordingly demand the most careful and detailed examination, an examination much more thorough than can be attempted within the limits of this work.

The statement just made is often denied, and that in such a manner as to suggest not merely that the opposite is the truth, but too obviously the truth for that to be called in question. The difference of opinion results from a difference in the point of view, but the point of view of those who contend that geographical conditions are counting for less and less instead of more and more would seem to be less conducive to clearness. Those who hold this view will point out that now where an isthmus stands in man's way he cuts it; a mountain, he bores it. True, but those who think only of this fail to notice that in the case of those epoch-making achievements wide-reaching geographical relations determine what isthmuses to cut, what mountains to pierce, and a close study of the local conditions is made to decide where and how the works had best be carried out. Railways, we are told, make man no longer dependent only on inland waterways for the carriage of bulky produce long distances. True, but in the laying of railways through hilly or mountainous country more care than ever is being taken to avoid stiff gradients and sharp curves, and similar care is now taken in the alignment of great motor roads. The steepness of the gradient on the west side of the Kicking Horse Pass across the Rocky Mountains ultimately compelled the Canadian Pacific Railway to provide an easier descent at the cost of a somewhat lengthened route. In the north-west of Switzerland an even more striking change was made under the imperious demands of modern competition. A tunnel already existing at a high level through the Hauen-

stein has been superseded by another nearly at base level. In some cases the influence of the superficial configuration of a region or the traffic it supplies on the means of transport is seen in another way, as the determining cause of electric in place of steam haulage.

The opening up of the entire world by improved means of communication is leading capitalists to search out every part where development is possible and to remove obstacles to development wherever that can be done, but the very fact that man is acquiring greater power in dealing with nature makes clearer the limit beyond which he cannot pass in his modifications of the original conditions. Nowhere is this clearer than in the creation of oases, where lie side by side 'the desert and the sown.' Irrigation in recent years has been greatly extended in many parts of the world, but geographical conditions determine just where it is possible. The tendency towards an ultimate prevalence of geographical conditions in determining the distribution of commerce and industry is, it is true, a tendency to a remote result. The influences tending to localise industries in particular regions are indeed very varied and complex in their action, especially in modern times. On this subject the reader is referred to what is said under Commercial and Industrial Towns on pp. 106-15, and here it is enough to add that the chief means of thwarting the dominant tendency of geographical conditions in commerce and industry is not man's increasing control over nature, but his political action, which, either by tariffs or by other means, may direct commerce more or less into certain channels.

The advantages that may be expected to be reaped when the development of commerce has reached its goal are the enjoyment of the greatest possible variety of commodities at all the habitable parts of the earth (that is, the greatest variety possible for each place), and the utmost attainable stability of prices. When the network of commerce is complete in its main lines, when it has only to be gradually and regularly extended or made more intricate with the development of population, the deficiencies in the natural products of one region will be supplied with the least possible delay and at the least possible cost from any surplus that may accrue in other regions. It is true that this will take place only on condition that the region so supplied has something to give in exchange for that which is supplied; but with reference to this proviso, it is an important consideration that the stability of prices towards which a fully developed commerce tends is in itself in the highest degree favourable to that foresight which is the necessary condition of ensuring that stability. It facilitates a just estimate of the future. Rendering foresight easier it makes prudent conduct more certain of reward, and may be expected, therefore, to render its practice more general among the community.

Meantime, however, it cannot be forgotten that, however fast

commerce may seem to be hastening towards its goal, it is still very far from having reached that goal. What we now see, accordingly, is the greatest haste on all sides to secure such advantages as may offer themselves for the prosecution of commerce and industry; we see an extreme phase of competitive and aggressive commerce as between nation and nation, individual and individual.

It is only with nations that we have here to do, and we may now note the principal means by which nations, whether through their governments or through other institutions, endeavour to promote their own commerce and industry.

As the first of these means may be mentioned protective tariffs; that is, duties levied upon imports upon such a scale as to encourage the production of the goods so taxed in the country itself by the total or partial exclusion of such goods of foreign origin. It is obvious that by this method only certain branches of internal commerce of a country are fostered, and the external commerce of the country is hampered. But it may be pointed out that in so far as such duties may be necessary or may help to establish an industry in a region in which it is fitted by natural advantages to take root and flourish independently of such fostering, the imposition of duties of this nature tends in the direction of the goal towards which commerce as a whole is moving. The direct and immediate effect of high tariffs is, however, opposed to the tendency of the changes in progress referred to on p. 7, and especially of the rapid multiplication of means of communication. When efforts of one kind are being constantly made to cheapen the supply of commodities it is scarcely credible that those who consume the commodities will always consent to have their price raised by an arbitrary barrier.

This last remark is made solely from the point of view of commerce, and does not exclude the consideration that there may be other reasons for the imposition of tariffs. The term key industries has been applied to such as are considered essential for the good of the state. In our own country agriculture and certain chemical industries, in particular the manufacture of commodities required for the production of coal-tar dyes and high explosives, are among those which since the First World War have been regarded as belonging to this class.

Export duties are not so frequently levied as import duties, although they are becoming more common. Obviously, they can be levied only on those commodities in producing which the state levying the duties has by nature an advantage so great as almost to amount to a monopoly such as was enjoyed during the Middle Ages by England in certain kinds of raw wool, the export duties on which made up for centuries the great bulk of the revenue of the state.

Bounties—that is, payments made directly or indirectly on the exportation of goods—are another means sometimes resorted to by governments with the view of encouraging industries; and with reference to these also it may be said that if it can be proved that a bounty has ever served to establish an industry capable afterwards of being maintained on a self-supporting footing, then a similar plea may be entered in favour of this aid to industry. One of the commonest forms of bounty now in use is the paying of a subsidy to certain lines of shipping (generally, however, in return for services in the carriage of mails or otherwise). The sugar industry is the most important of those which have been affected by subsidies in recent years. Allied to bounties are rebates on taxes or costs to which the industry would normally be subject. Great changes in the extent of government interference with trade by way of protective duties or bounties are, apart from war, perhaps the most deplorable, because the most arbitrary, of the disturbances of the commercial relations subsisting at any period.

We have all experience now of the effects of war on industry and commerce, though we are even yet unable to gauge their full extent. They include immense destruction of life—and so of labour power—at the period of greatest vigour; the impairment of the health of multitudes not directly engaged in the war; fluctuation of the birth-rate in the belligerent countries;¹ destruction of property of all kinds; diversion to various destructive agencies of the labour normally devoted to providing for the future, especially by the creation of transport facilities, the erection of plant, and the manufacture of machinery; the sudden redistribution of capital, where that redistribution takes place within the state, the burdening for years to come of the bulk of the population with payments due to the smaller section of the people who form the state creditors, and, where that redistribution operates between state and state, changes in the relative advantages for production and commerce which may prove permanent. There is the loss of markets to a belligerent nation, a loss which may never be recovered as others step in as

¹ The following table, based on the United Nations' *Demographic Year Book*, shows the numbers of the live births per thousand of the population between 1938 and 1950 in certain countries. After an initial decline early in the war in the case of the European belligerents, the Allied rates mounted to a maximum in 1947, in the first flush of victory, but later fell away from that level.

	1938	1941	1942	1943	1945	1947	1950
U.K.	15.5	14.4	15.9	16.6	16.3	20.7	16.1
Germany (a) . . .	19.7	18.6	15.0	16.0	—	16.5	16.2
France	14.9	13.4	14.8	15.9	16.5	21.3	21.0
Canada	20.6	22.2	23.4	24.0	23.9	28.6	26.8
U.S.A.	17.6	18.9	20.9	21.5	19.6	25.7	23.5

(a) Rates to 1943 for Germany as constituted in 1937. Later rates for Western Germany only.

suppliers and a permanent rearrangement of the channels of commerce results. It is not out of place here to refer also to the mutual hatred and distrust between nations resulting from war, inasmuch as industry and commerce nowadays depend so largely on credit, which implies mutual confidence. Politicians, capitalists, captains of industry, and the workers are alike bewildered as to the situation, and after two great World Wars we do not know the new level from which rebuilding may start in conditions that give some promise of security for the future.

Governments assist commerce by maintaining officers known as consuls in the principal mercantile towns of foreign countries; the officers so named being charged not merely with the duty of looking after the interests of subjects of the country represented by them in the sphere of their consular districts, but likewise with that of furnishing such information as is likely to be of use to the merchants of that country. In many cases commercial attachés do this work, the results appearing in such typically fine reports as are issued from time to time by the Board of Trade. The name consul is of Latin origin, and the present application of the title originated with the practice of maintaining such officials among the trading communities of Italy in the twelfth century. In modern times the former Austrian Empire had an academy controlled by the Minister of Foreign Affairs for the education of candidates for the diplomatic and consular services. Being primarily intended for those preparing for service in the East, it was known as the Oriental Academy; and the course of instruction embraced a legal training, military geography, and tactical science, as well as the teaching of 'Turkish, Arabic, Persian, Hungarian, French, Italian, English, Russian, Modern Greek, and Servian.'

British merchants and manufacturers have not the advantage of being able to consult British consular reports with reference to the extensive areas embraced by the Commonwealth, but this want is met more or less in other ways. First, the self-governing portions of the Commonwealth maintain representatives under various titles, who make it their business to disseminate information likely to promote trade between the United Kingdom and the countries which they represent. Then, in the case of the British dependencies, the Colonial Office issues from time to time reports similar in their content to those received from consuls in foreign countries. Thirdly, in recent years the home government has appointed trade commissioners to various parts of the world, including those within the Commonwealth.

The establishment of chambers of commerce, or voluntary associations of merchants in different localities, is now almost universal, and similar chambers are now being established by merchants of different countries in foreign cities where a large

amount of business is conducted. It is in keeping with modern tendencies that an Association of British Chambers of Commerce and an International Chamber of Commerce have been formed.

Another method of promoting national commerce now coming into more and more general use all the world over is the establishment of commercial libraries and museums, and those large fairs or exhibitions which have become increasingly popular in recent years. Exhibitions are a kind of temporary commercial museum, and floating exhibitions intended to convey samples of a country's commodities to various stations in distant markets are one of the latest means resorted to in different countries with the view of promoting national commerce.

In the United Kingdom the Imperial Institute, founded in 1887 as a national memorial of Queen Victoria's Jubilee, placed in 1903 under the Board of Trade, and now being reorganised under various government departments, includes a commercial museum of Commonwealth and Empire products and is actively concerned in spreading knowledge amongst the rank and file of citizens, especially young people. Most Commonwealth governments have in their London offices permanent exhibitions of the commercial products of their respective countries; whilst it has been proved that great exhibitions such as that held at Wembley in 1924-25 have been of more vital interest than museums. This was shown by the Great Exhibition of 1851 and was behind the attempt to repeat that success a century later by the Festival of Britain in 1951.

Commercial and technical education are other means of promoting national commerce of great importance. This is recognised by the existence of many professional institutes (such as the Institute of Bankers) which provide educational courses and conduct examinations. Nearly all of them include commercial geography in their requirements.

An inevitable feature of war, especially war on a gigantic scale as in 1914-18 and 1939-45, is the extension of government control of industry and even the direct participation of the government in industry. On the one hand it has to be kept in mind that such success in industry as was achieved by the government during the wars was secured at the expense of the taxpayer, whereas industry must be able normally not merely to maintain itself by its own produce, but also to provide for its own growth. On the other hand, one cannot forget that for a long time the tendency in many parts of the world, including the British Commonwealth and Empire, has been towards a great extension of the share taken by the state in industries of various kinds. The private ownership of railways, as in the United States, is now exceptional. The Canadian government is the owner not only of a large part of the railways in that country but of elevators and steamships; and ships for trading pur-

poses are owned by other governments. Under the Soviet system in Russia ownership and control are all-embracing. Our own government has been a large proprietor of shares in the Suez Canal since 1875; during the First World War it became a partner in the Anglo-Iranian (formerly Anglo-Persian) Oil Co., and gave financial support to companies manufacturing dyestuffs; in between the two wars, marketing boards, quotas, and subsidies multiplied; and after the Second World War nationalisation became a main plank of Socialist government policy.

Several of these means of retaining and promoting commerce remind us forcibly of the closeness of the bonds with which commerce is steadily drawing different countries together, and of the complicated action and reaction between different parts of the world to which commerce gives rise. The improvement of machinery, of processes of production, of means of communication, the better organisation of industry, the advancement of education in one country, demand similar advances in other countries. New wheat-fields in America necessitate improved systems of agriculture and the advancement of agricultural education in England, the introduction of better agricultural machinery into Russia. The perfecting of the processes in the refining of beet-sugar in Germany demands better organisation among the cane-planters of the West Indies and Guiana. The working classes more and more clearly recognise that any advantage secured for themselves in one country must be extended also to other countries. As long ago as 1885 the United States consul for Dundee stated that the longer hours worked in the Calcutta jute-mills were believed to be the determining cause of the depression in the jute industry of Dundee, arising from the competition of Bengal; and he added that both employers and employed were consequently anxious that the ten-hours-a-day Factory Act should be extended to India. On the continent of Europe a long agitation in favour of international legislation on this subject led, at least in part, to the establishment of the International Labour Office in Geneva. The power of Japan to compete in world markets on too advantageous terms would be obviated by a higher standard of living and hence higher labour costs in that country.

It may perhaps be looked upon as one of the hopeful features for the future that the importance of the considerations set forth in the preceding paragraph is coming to be more and more clearly recognised, and that the more enlightened among both masters and men are becoming increasingly convinced that it is only by mutual and world-wide co-operation that some of the most perplexing problems of industry can find a solution. 'After all,' said the Rt. Hon. G. N. Barnes in a speech on the Treaty of Peace Bill in the House of Commons on July 21, 1919, 'hard conditions of life are not due to any conscious cruelty on the part of any class or any

individual. They are rather due to fundamental causes which can be removed only by the co-operation of classes.' Instances of the readiness on the side of capitalists to co-operate in this way, especially in the way of providing good housing and garden accommodation, are already too numerous to particularise. If one result of the World Wars should be that all countries came to realise that the healthiest conditions in the widest sense of the term for all engaged in industry were essential to the highest prosperity of industry, and all governments accordingly made it a prime aim to do what in them lay to secure such conditions as a permanency, we should all then be able to acclaim at least one good as issuing from those calamities. The establishment of the Ministry of Health in Britain may be noted in this connection.

ECONOMIC STATISTICS

One of the chief uses, if not absolutely the most important of all the uses of the study of Commerical or Economic Geography, is to enable us to form some reasonable estimate of the future course of commercial development, so far as that is governed by geographical conditions. Such an estimate must, of course, be based on one's knowledge of forces that can be seen in operation at the present time, and must be recognised as liable to be falsified by discoveries which it is impossible to foresee. The keenest and most widely informed have made forecasts which have proved to be utterly wide of the truth, but which could not be called unreasonable at the time. When Adam Smith wrote that 'the small quantity of foreign corn imported, even in times of the greatest scarcity, may satisfy our farmers that they can have nothing to fear from the freest importation' (*Wealth of Nations*, Book IV, Chap. II), no one could be expected to foresee the ultimate consequences of the inventions of the ingenious young instrument-maker, James Watt, whom Smith had befriended at Glasgow. When Dr. P. Colquhoun in his *Wealth of the British Empire* (2nd edition, 1815) demonstrated the utter inutility of the new British colony in Australia, even that can hardly be pronounced unreasonable in the light of the knowledge of the time. Such forecasts may serve to remind us of the tacit qualifications with which all attempts to anticipate the future are to be interpreted, but do not show the inutility of making such anticipations as the circumstances allow.

In attempting such forecasts statistical data are unquestionably an important aid. In Commercial Geography the value of figures is twofold. First, they help at any particular time to distinguish the important from the unimportant. Second, when we have figures for a series of years they direct attention to changes that have been in progress in the past, and may thus serve to suggest the most fruitful branches of inquiry with reference to any geographical causes that may have contributed to such changes, and help us to estimate with more chance of success their probable action in the future. In both ways they serve as a guide to what is most worthy of examination in our special subject. In order that they may illustrate changes in progress it is obvious that the series

are likely to be the more instructive the longer and the more continuous they are.

Figures stating values may be very misleading in making comparisons between different periods even in the trade of the same country. With a view to removing this misleading tendency various index-numbers, as they are called, have been calculated, and need explanation. For the individual commodities the index-number merely expresses the ratio of the average value of a given quantity of each commodity in a given year to the value which it would have had at the average price of the year or period which is taken as the base. This is simple, but such index-numbers are not index-numbers in the proper sense of the term, that is, numbers calculated to serve as an index of other numbers not definitely known. This is what is aimed at by the general index-number, which is based on the average price of many commodities, all articles largely consumed, such as wheat or wine or raw materials, but including such raw materials as bricks and hewn fir. In working out a general index-number the commodities may be regarded as of equal importance but in other calculations the commodities selected are not allowed to count equally, but are weighted or multiplied by different numbers in different cases.

If then the selected commodities may be taken as illustrative, the general index-number will thus serve to show how far values have been affected by some cause or causes having a wide-reaching influence, and the variations in the index-numbers for the individual commodities when compared with the general index-numbers will be the means of indicating how far some special cause or causes must have affected their fluctuations in value. It should be noted that the basal period is arbitrarily chosen. The old Board of Trade index used 1900. In 1921 the Board of Trade adopted an index-number on a new principle; new bases were adopted in 1938 and 1947.

Whatever be the cause of changes in index-numbers, the facts underlying those changes modify, and sometimes to an important degree, the significance of the values given for exports and imports. For example, if we take the average value of imports into the United Kingdom for each of the periods of five years from 1871-75 to 1906-10, we find that there is only one, namely, the period 1886-90, which shows a decline in value as compared with the previous quinquennium—in round numbers £390m. against £400m. But if we apply the Board of Trade index-number, base 1900, to these figures the values become changed to £333m. in 1881-85 and £379m. in 1886-90, showing an increase in the latter period of nearly 14 per cent. instead of a decrease of about 2½ per cent. Now with an index-number calculated as was the old Board of Trade figure by allotting a weight to each commodity proportional to the average value of annual consumption, this shows that during

the latter period considerably more supplies of food and raw materials must have been coming into the country than in the one before. That being so, we may be sure that those increased supplies would find their way into the hands of consumers. Stocks are not kept on indefinitely in the hope of better prices. Perishable goods cannot be. So far as the increased imports, then, were food-stuffs, they must have been a direct benefit to the consumers; so far as they were raw materials, increased supplies must have helped to maintain the demand for labour, for they were imported in order to be used, and manufacturers still found their advantage in using them in spite of the fact that they did not see their way to sell the products at former prices. It is not even a necessary consequence that the lower selling prices of the products meant lower profits to the manufacturers.

These considerations have a special bearing on the trade returns recorded in this volume. During and after the Second World War prices increased very greatly, so that imports and exports in 1950, for instance, were as a rule valued at very much more than in 1937, though the actual quantities of the goods imported and exported were often less. The Statistical Office of the United Nations has accordingly tried to introduce an index of quantity in trade, somewhat comparable with a cost of living index.

Further, when the tables of imports and exports are used for making comparisons of the trade of different countries one may be led into error in various ways. First, it is important to remember that such returns for the same country do not always refer to the same economic unit. When accessions of territory are gained by any country there is likely to be a change of this nature; similarly when territory is lost. Next, it is to be noted that there is no uniformity in the nature of the total given for the trade of a country, whether the commerce referred to be designated general or special. Under the name of general commerce all articles imported and exported are included, but under the head of special commerce only goods imported for home consumption and goods of home production exported are supposed to be reckoned. But this is far from being uniformly true. Very generally goods that enter into circulation in the country free from the control of the customs are taken as part of the special commerce of the country. Thus, in the tables of German trade for 1911 raw cotton, caoutchouc, and rice appear among the special exports to the aggregate value of more than £6,000,000, although obviously none of these is a product of Germany, and we cannot tell how great may have been the value of other re-exports when the goods are of such a nature that they may or may not have been German products. In our own country, on the other hand, no attempt has been made to distinguish goods imported for home consumption, but a distinction is always made

between exports of native origin and manufacture—whether free goods or goods subject to customs duty—and exports of foreign or Commonwealth origin. Note that goods that have undergone the slightest manufacturing operation, such as overseas wool combed in Great Britain, are included (rightly) among the goods of British manufacture. In two points the British tables are misleading or inadequate from causes which perhaps cannot be remedied. The general tables are exclusive of what is called transshipment trade, of which a separate statement is made. The transshipment trade is exclusively of articles imported and exported in bond, and may include, actually does include, a considerable amount of trade on British account, that is, the import of goods bought by British merchants and resold by them abroad.

Statistics of external commerce usually include statements as to the description of the goods exported or imported, the quantities, the countries of origin or destination of the goods, and the value. In the case of many articles, and especially those most largely imported and exported, such as food-stuffs and raw materials, the description of the article presents no difficulty, so that one may deal with returns as to such commodities in making comparisons between period and period in the trade of the same country, or between different countries for the same or different periods without fear of being misled. But in many cases it is otherwise, and difficulties in making comparisons for the same country for long periods are constantly being made by tariff changes necessitating different classifications, and even where there are no tariff changes alterations in the classification of goods are often made simply with the view of giving a more satisfactory statement of the facts of commerce. However useful such changes may be from one point of view, it has always to be remembered that they have the drawback referred to. This drawback arises, it should be added, even when increased care is used, and hence increased accuracy arrived at in the collection of the original data.

In England the earliest systematic collection of commercial statistics appears to have been made in 1697. From that time down to 1797, inclusive, the values entered for English commerce and, after the union of the Parliaments in 1707, for that of Great Britain, were official values based on the prices of 1694 and for new articles on the price of the first year of their introduction. The so-called values were, accordingly, not true values, but for each commodity served to give indications of changes in quantity from year to year, while the totals had little meaning at all. From 1798 in the case of exports declared values were added, not substituted, so that we have the absurdity in Porter's *Progress of the Nation*¹ of two tables giving professedly the same thing, the value to the last pound of

¹ Edition 1851, p. 356.

exports from the United Kingdom from 1801 to 1849, yet utterly divergent from one another, showing from 1820 onwards a steadily growing excess of official over declared values till in 1849 we have

Official Value	£164,539,504
Declared Value	63,596,025

In the commercial statistics of the Netherlands the use of official values was maintained until the end of 1916. The 'values' in Dutch returns were based on the prices of 1860 or thereabouts. In one case, Peruvian bark, the so-called value was, in a year just before the First World War, some seventy times the true value.

In the case of imports computed values, that is, values officially estimated in accordance with what were believed to be the current prices of the time, were introduced and used in Britain till 1870 inclusive, but from 1871 onwards declared values have been entered for imports also. This calls for great caution in extending comparisons of import values farther back than 1870. According to British practice import values are those at the port of arrival, that is, include freight but not merchant's profit, export values those at the port of shipment, 'free on board' (f.o.b.). Notes are given in the official tables as to the mode of valuation adopted by different countries. The problem of comparing the trade of the countries of the world has been much simplified by the conversion of national units of weight and volume into their metric equivalents in all publications of the League of Nations and its successor, the United Nations Organisation.

No student of commercial geography can be unaware how many subjects there are that still await investigation, and in many cases how far the means for obtaining the desired information are lacking. This deficiency is felt in a peculiar degree with regard to the trade, and more particularly the home or internal trade, of our own country, but in all countries one has often to regret that the available data refer to the country as a whole instead of particular regions which it would be useful to investigate. The late Lord Stamp in his important Presidential Address to the Geographical Association in 1937 dealt with the contacts between geography and economic theory. He pleaded for an understanding of economics by geographers and for a greater use of geographical facts and illustrations by economists. He pointed out that five types of geographic-economic studies could be distinguished: (a) the simple static, when a present-day geographic fact was explained by an economic fact—really no explanation at all; (b) the inductive static, when several such examples were used to formulate a general statement; (c) the simple dynamic, when the element of change and the historical factor were introduced; (d) the inductive dynamic; and finally (e) the formulation of general economic or geographical laws

based on a wide study of examples of the fourth class. He held that economic geographers had not yet reached the fifth stage and that an immense field of work remained to be explored.

Some of the suggestions for further investigations which Chisholm listed in earlier editions of this work might well be revived in the light of such a general programme; namely—

How far British rule in different parts of the world has contributed to the growth of the trade of foreign countries.

The conditions of commercially successful and unsuccessful irrigation.

The advantages of rural and urban centres for different kinds of manufacturing industry.

The effect on commerce of the construction of particular railways.

The relations of seaports to their hinterlands.

The influence on commerce of the possession by different countries of bulky commodities such as coal, timber, salt, ice, cement, wool, grain, and the like.

The effect of local labour, local supplies of raw material, and local markets in the development of manufacturing industries.

The exhaustibility of natural advantages for any particular kind of production, as evidenced by a rapid followed by a slower expansion of a local industry concerned in such production.

The effects of government interference in modifying the influence of natural advantages.

The gradual conversion of manufacturing industry from the lower to the higher branches.

GENERAL FACTS RELATING TO THE PRODUCTION, DISTRIBUTION, AND EXCHANGE OF COMMODITIES

I. CLIMATE

Under the head of climate we have to consider here only the main climatic factors affecting the production and distribution of articles of commerce. The commodities whose production is most immediately affected by climatic conditions are those derived from the vegetable kingdom; but those of animal origin, being directly or indirectly dependent on vegetation, are subject to the same influences. It is, however, climate as influencing vegetation, and more particularly as influencing cultivation, or the bestowal of human labour in promoting vegetation, that we have to keep chiefly in view in considering the effect of climate on the production of commodities.

For all kinds of vegetation there is required a certain amount of **heat** and a certain amount of **moisture**. The great source of heat is the sun, and of moisture the ocean, where evaporation is brought about through the heat of the sun. The winds, however, are the carriers of both heat and moisture, so that it is essential to study the direction of the prevailing winds in order to understand the distribution of temperature and rainfall over the globe. **Temperature** decreases on the whole from the vicinity of the equator towards the poles, but the rate of decrease is very unequal over land and water. Water being more slowly heated and cooled than the land, the diminution in temperature towards the poles is more rapid over the ocean than over the land in summer, less rapid in winter. The ocean and other large bodies of water for this reason have a moderating effect on the temperature of adjacent lands. This effect is brought about mainly or solely by the agency of the winds. With reference to land temperatures accordingly it is more important to consider the direction of the prevailing winds than the mere distribution of land and water. Winds depend on local differences in the pressure of the atmosphere. They tend to blow from regions of high pressure to regions of low pressure. Regions of low pressure occur over the warmest parts of the ocean near the equator, and in the interior of the great land-masses in summer, when they are most directly exposed to the rays of the sun. Over the ocean the region of high temperature and low pressure forms a belt,

towards which winds blow more or less from the north and south. The direction of these winds is, however, modified by the rotation of the earth, in consequence of which these winds, known as the **trade-winds**, blow more or less from the east, over some parts of the ocean with such regularity that, in the language of Sir Thomas Browne, 'sailing from Lima to Manilla . . . you may fasten up the rudder and sleep before the wind.' It is important, therefore, to observe and constantly to bear in mind that over a great width of the ocean in low latitudes extending on both sides far beyond the tropics, there is a strong tendency for the winds to blow away from the west sides of the continents and towards the east sides of the continents. The position of this wide belt, or rather of the two wide belts separated by an intermediate belt of calms corresponding to that of lowest pressure, is not constant. It moves north and south with the sun, along with the whole system of atmospheric pressures dependent on the height of the sun above the horizon. Wherever and whenever the trade-winds blow, however, they have a certain effect in mitigating the temperatures of the regions exposed to them.

Outside of the trade-wind region there is normally in the winter months an area of low pressure in the North Atlantic to the north of 60° N., and in the North Pacific a similar area more to the south. Towards each of these the winds tend to blow, but in consequence of the rotation of the earth not directly, but in great spirals in which the direction of movement is opposite to that of the hands of a watch. Hence south-westerly, and consequently warm, winds prevail at this season on nearly all the west coasts of Europe and a large part of the west coast of America, while northerly, and hence cold, winds prevail on the opposite coasts, that is, on the east coast of North America, and the east coasts of northern Asia. The contrast between the temperature of these coasts in corresponding latitudes is another great fact constantly to be borne in mind, as well as the fact that the benefit of the relatively high winter temperatures is carried by the winds a greater or less distance inland. Warm ocean currents flowing in the same direction as these winds blow help to maintain their temperature, but it is to be observed that without the winds these currents would have little effect on the temperature over the land. In the summer months the area of low pressure still exists in the North Atlantic, so that in that period also south-westerly winds prevail, though not so strongly on the west European coasts. In the North Pacific during the summer months an area of low pressure can scarcely be said to exist. In the southern hemisphere outside of the trade-wind belt the conditions are greatly altered by the fact that the amount of land is very small. It is enough to say that there the prevailing winds throughout the year, at least to the south of 40° S., are westerly. These westerlies

blow more constantly over the open oceans of the southern hemisphere than elsewhere and are often referred to as the 'Roaring Forties.'

The influence of the pressure of the air over the land in determining the direction of the prevailing winds is most marked where there are great bodies of land to the north or south of seas in lower latitudes, above all in eastern Asia and in Australia. In the interior of eastern Asia in summer are regions of very low pressure, in winter of very high pressure. Hence, in summer ocean winds, south-westerly, southerly, south-easterly, blow over all the south-east of Asia, including the islands, from the Indian peninsula to about the parallel of 60° N. During the winter land-winds, north-easterly, northerly, north-westerly, prevail in the same region. These are the **monsoons**, which have an important effect on temperature as well as on rainfall. The word monsoon is derived from an Arabic word meaning a season, and is still used, in India, as meaning the rainy season. The summer winds, though blowing from lower latitudes, do not tend to raise the temperature, because they come from the ocean; but the winter winds being land-winds as well as coming from higher latitudes have a marked effect in lowering the temperatures, more particularly in the temperate zone. For this reason also the winter temperatures in the east of Asia are much lower than those in corresponding latitudes in the west of Europe and Africa, a fact of great importance in commercial geography. In Australia similar results are due to the alternation of high and low pressures in the interior, but owing to the difference of hemisphere the seasons and the directions of the winds are reversed.

In consequence of the facts stated with regard to the prevalent winds, there is, in the temperate zones, and more particularly in the northern hemisphere, a general lowering of the mean temperature from west to east over the land, due chiefly to an easterly increase in the cold of winter, and partly compensated by an easterly increase in the heat of summer. The increase in the extremes of heat and cold is greatest in the eastern or broader of the two great land-masses, and the lowest temperatures on the earth have been recorded towards the east of Asia, some distance inland, since the sea everywhere has some effect in mitigating extremes of temperature. While the eastern land-mass thus exhibits greater cold and greater contrasts of summer and winter temperature in the east of Asia than are presented in the east of America, its western or European portion, being exposed to warmer winds traversing a warmer ocean than those which visit the western coasts of North America in high latitudes, is characterised by a more equable climate and higher winter temperatures than corresponding latitudes on the latter coasts; and, in general, we find that when we compare equal latitudes in the west of America and the west of Europe, the latter continent shows

the higher temperatures; but when we make a similar comparison for the east of America and the east of Asia, the higher temperatures are found in America.

By way of illustrating these great general facts by means of others having more bearing on the production and distribution of mercantile commodities, it may be mentioned that the northern limits of various cultivated plants whose range is somewhat rigorously determined by climate, such as the orange and the vine, are farther north in Europe than in the west of North America, and farther north in the east of North America than in the east of Asia; that whereas the whole of the west coast of Norway, extending to beyond 70° N., is at all times free from ice, the northern coasts of the peninsula of Alaska, in about 57° or 58° N., are regularly beset by ice in winter; but, on the other hand, whereas the eastern coasts of North America are rarely encumbered by ice south of the Gulf of St. Lawrence, in about 46° or 47° N., ice is to be seen in the Chinese Gulf of Pechili in lat. 40°; and, again, Halifax, in Nova Scotia, in 44½° N., is nearly always open, and thus can serve as a winter-port for the Canadian Dominion; while the Russian seaport of Vladivostok, in the east of Siberia, to the south of 43° N., is closed by ice for about a third part of the year. With regard to cultivated plants, however, it must be mentioned that those which are able to profit by long and hot summer days during a very short summer can be grown in higher latitudes in eastern Asia than in eastern North America. Rye, barley, and even cucumbers, can be grown at Yakutsk in eastern Siberia, in 62° N. (the same latitude as the mouth of the Yukon in Alaska, and Frederikshaab in Greenland), the barley being sown in the first days of May, and ripening about the middle of July—within two months and a half.

The land surfaces of the **Southern Hemisphere** are too narrow to exhibit the easterly increase in the extremes of temperature, especially since they do not extend into those latitudes in which that increase is most marked. One circumstance is, however, noteworthy regarding the climate of the temperate zone of the southern hemisphere, namely that it is generally colder, at least on the land, than in corresponding latitudes of the northern hemisphere; so that the limit of cultivation of various plants is in a lower latitude to the south than to the north of the equator. A glacier descends in Chile to the water's edge in about lat. 46° S., a latitude corresponding to that of the middle of France in the northern hemisphere. In the Australian state of Victoria, the orange is not cultivated for its fruit except in the extreme north-west in a latitude one or two degrees nearer the equator than the latitude of southernmost Spain. In the South Island of New Zealand, which is in latitudes corresponding to those of northern and central Italy, oats is the principal crop, as it is in Scotland and Ireland.

As the winds are the carriers of heat and cold it follows that the physical configuration of the land, apart from the direct effect of elevation, may indirectly affect temperature. Mountains, by obstructing winds, in some cases afford protection from cold winds, in others prevent certain districts from getting the benefit of warm ones. Temperature is also greatly modified by evaporation and condensation of water vapour, evaporation always tending to bring about a lowering and condensation a rise of temperature.¹ Heat is lost during the night by radiation, and since there is greatest loss of heat in this way where the atmosphere is dry, clear, and rare, there are great extremes of heat by day and cold by night in the interior of continents, especially at high elevations. Low temperatures prevail at high altitudes, but it is to be remembered that these low temperatures are those of the air. There is no diminution, but the reverse, in the strength of rays of the sun on any body directly exposed to them.

It is important to be clear as to the meaning of the diminution of mean temperature with altitude. This is not a phenomenon observable equally at all times of the day and year. A statement as to the rate of that diminution, usually given as equal to about 1° F. for every 300 feet of ascent,² expresses the result of averaging differences of temperature in a vertical column of air or in adjacent vertical columns, at different times and in different situations, and in a great many cases it is of much more practical importance to observe that at certain times in certain situations the difference is the other way, the lower temperatures at the bottom, the higher on the upper slopes or even on mountain tops. This will be understood when it is borne in mind that various causes are at work affecting air temperatures. First it should be noted that the air is heated principally not by the direct rays of the sun, but indirectly through the warming of the surface of the earth which then imparts its heat in various ways to the air above. Naturally, therefore, when the surface of the earth is warm, the air is all the warmer the nearer it is to the surface, and this difference is all the greater on account of what occurs in connection with one of the modes of conveying the heat from the ground to the higher strata of the air, namely, by means of convection currents. The air nearest the ground expands in consequence of its greater heat and so becomes relatively light and rises. But as it rises it becomes subjected to less pressure and expands still more, and this expansion is accompanied

¹ The conversion of water into vapour, like the conversion of ice or any other solid into the liquid state, involves the expenditure of heat. That is, heat (in the scientific sense of the term) is used in the conversion, and is not available for raising or maintaining temperature. Meanwhile, of course, temperature may be maintained, and even raised, by external supplies of heat (as from the sun, or a fire).

² The rate is less in winter or at night, more in summer or by day.

by an instantaneous lowering of temperature permeating the whole mass. As long as the air rises and there is no condensation of the water-vapour in it into cloud, rain, snow or any other form of water, this cooling goes on at the rate of 1° F. for every 180 feet of ascent, a figure which does not express an average but states a fact observed with every rise of air, whether by day or night, in summer or in winter. The rate of cooling, however, is checked when any condensation takes place. But if the heating of the air above takes place from the ground upwards, so also in a large measure does the cooling at night. At night indeed every part of a column of air loses heat by radiation upwards into space, and the higher strata lose heat in this way most rapidly on account of the greater rarity and frequently also the greater dryness of the atmosphere. But the ground loses heat in this way, above all on clear nights, much more rapidly than any part of the air column, and that brings about a more rapid cooling of the air near the ground. The adjacent stratum is cooled by actual contact. The strata immediately above that are cooled by a more rapid radiation of heat downwards to the ground than upwards into space. The result is that, at the coldest part of a summer night, there is a regular increase of temperature from the ground upwards, a so-called inversion of temperature, at least up to the height of more than 2,000 feet above the ground, whereas the diminution of temperature in the same direction at the hottest period of a summer day may be equal to about 2° F. for every 300 feet of ascent, or double the average diminution (*cf.* page 26). This inversion of temperature is important in cultivation as it gives rise to the 'frost pockets' mentioned below, so well known to gardeners. Indeed 'micro-climates' may occur even within the area of an ordinary garden which profoundly influence the growth of plants.

From this account it will be understood that the lowering even of the mean temperature with altitude will differ according to the nature of the superficial configuration. Isolated peaks, exposed on account of their isolation to ascending winds from all directions, will show a much more rapid rate of diminution than mountainous country in which a large extent of the solid crust is raised to a high altitude. Where we have an extensive high level tableland, or even high valleys out of reach of ascending winds, air several thousands of feet above sea-level may be as near the ground, that is, as near the heating surface, as air above a plain only a few feet above sea-level, and the high ground in this case will be more intensely heated than the low ground by sunrays falling at the same angle on both. In such a case the only circumstances that bring about a lower mean temperature at the higher latitude are the greater rarity and generally also the greater dryness of the atmosphere. These conditions prevent the air from taking up heat as rapidly from the ground by day

and favour a more rapid cooling by night. The total lowering of the mean temperature, however, is reduced to a minimum. Hence it is that it is possible to cultivate wheat in western Canada in the same latitude as Snowden at as great a height as the top of Snowden. At Banff, Alberta, at the height of about 4,600 feet, considerably higher than the top of Ben Nevis, the ordinary English garden flowers such as larkspurs, campanulas, sweet-williams, stocks, pansies, and marigolds flourish even in September, and at the same season at Lake Louise, about 5,700 feet above sea-level, eschscholtzias, asters, and other flowers bloom freely.

The facts just mentioned cannot but suggest that it is difficult to attach any clear meaning to isothermal lines drawn on maps representing land with varied physical configuration, based on observed mean temperatures reduced by a common multiplier to so-called sea-level temperatures, and at any rate will serve to bring home to everyone that in economic geography we have to do not with sea-level temperatures but with the temperatures actually observed, a point emphasised by the late Professor Herbertson in his well-known paper on 'The Thermal Regions of the Globe.'¹ The isothermal lines drawn over the sea on two of his maps serve to indicate the great differences of temperature on different coasts in the same latitudes. The map showing, for different regions, the number of months with a mean temperature over 50° F., indicates how the temperature requirements of vegetation suited to the temperate zone are met, but it must be kept in mind that it does so only very broadly. It is not on mean temperatures even as actually observed that vegetation depends, but upon the actual temperatures experienced within a range that differs for different plants.

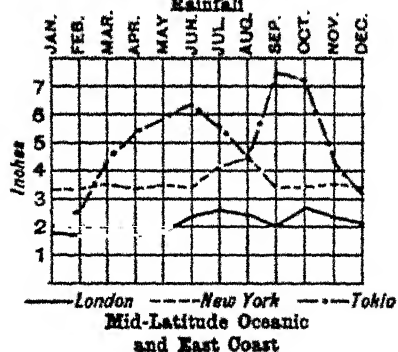
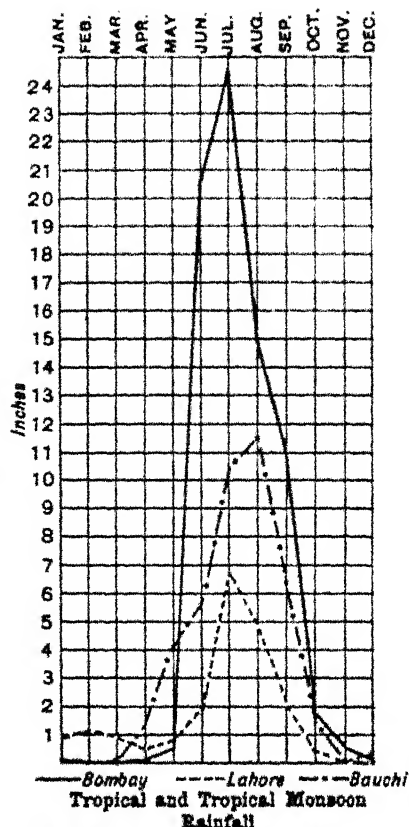
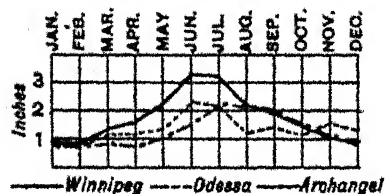
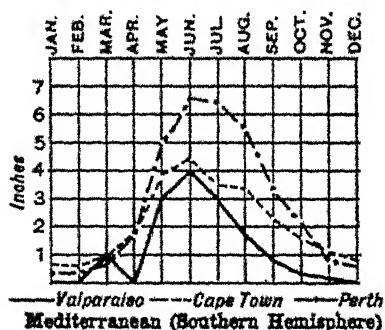
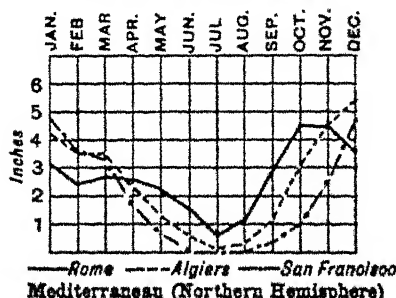
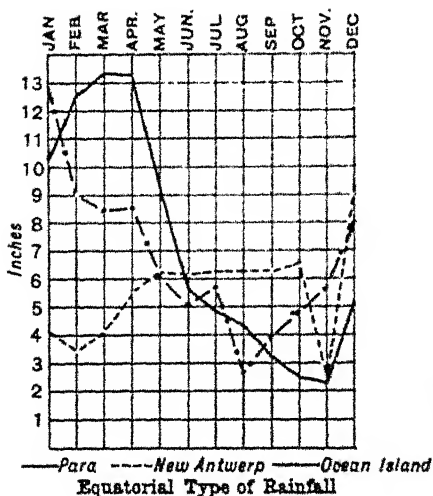
Differences in the range of temperature which different plants will stand make it important to observe the conditions in which exceptionally low temperatures are liable to occur on low grounds as compared with higher slopes. As heated air expands and rises so cold air contracts and sinks. In calm weather the air on mountain sides gets cooled by night more rapidly than on the valley bottoms. The radiation upwards is more rapid on account of the greater rarity of the air, and it starts from a lower temperature than at the valley bottom. Hence the air on the slopes becomes so heavy that it flows down the mountain or hill sides to the valley bottom, and there accumulates if there is no adequate outlet for it. Hence it is that, for example, in the choosing of sites for orchards in regions subject to low temperatures, the lie of the ground must be carefully studied. One must see that there is good air drainage, a free way of escape for descending cold air. Above all, one must avoid 'frost-pockets' or hollows in which cold air might accumulate like water in a lake. Where mountain valleys, in parts of the world with severe winters,

¹ *Geographical Journal*, vol. xl, pp. 518-29.

are shut off from the prevailing winds, the mean winter temperature is lower in the valley bottoms than higher up, and the celebrated Austrian meteorologist and climatologist, Hann, pointed out that in such valleys in the Alps the human settlements for that reason are found on the hill sides, not in the lower parts of the valleys. For the same reason, in part of the Appalachian mountains cultivation is mainly confined to what is known as the thermal belt, high enough up to escape the extreme rigours of winter. It is on the slopes of the hills, not in the valley bottoms, that wheat is grown round Yakutsk and in the upper Angara. In upland pastures sheep frequent the higher grounds at night.

As the great source of **moisture** is the ocean, for the most part the farther inland a region lies the less chance has it of receiving an ample rainfall, unless there are special conditions favourable to the condensation of water-vapour. Water-vapour is condensed through the more or less rapid lowering of the temperature, and one of the most frequently operative causes in bringing about that reduction of temperature is the presence of mountains, obstructing moisture-laden winds, and thus forcing them to ascend and become cooled by expansion. Consequently, regions on the maritime side of mountains often have sufficient rainfall when those on the other side have not. In the tropics there is generally a more marked distinction between rainy and dry seasons than in most parts of the temperate zone. This distinction is most marked of all in the monsoon regions, in which the winter winds are naturally for the most part dry winds, whereas those of the summer months come heavily charged with moisture and bring about a very high rainfall in the parts more directly exposed to them. In these regions accordingly we have the combination of heat and moisture specially favourable to vegetation, and this characteristic is particularly noticeable in the parts of the monsoon areas belonging to the temperate zone, which are in consequence greatly more productive than regions in the same latitudes elsewhere.

The distribution of rainfall throughout the year is illustrated by the diagrams on the next page. In studying maps of seasonal rainfall it should be kept in mind that seasons of heavy rain are also seasons of flood, and that even the normal floods of many regions with a high seasonal rainfall add greatly to the cost of road maintenance, and may render roads useless for long-distance travelling by making the dry-season fords impracticable. With the diagram illustrating the monsoon type of rainfall may be compared in the first place those for places in the trade-wind belt. The curves in the diagram of places on the east side of continents in that belt are all typical. During the summer months the areas of low pressure which are then found in the interior of continents have the effect of strengthening the trade-winds that tend to blow on the



↑
Mid-Latitude
Continental and
Cold Temperate

TYPICAL RAINFALL DIAGRAMS.

east side, which accounts for the marked preponderance of summer rain indicated by the diagram. On the east side of such regions accordingly we have a repetition of the combination met with in the monsoon areas. The rainfall curves in the diagram for places in the trade-wind belt on the west side of continents illustrate the variety of effects due to physical configuration and outline rather than the characteristic rainfall distribution of those regions. In those regions it must be remembered that the tendency for the winds to blow away from the land is partly counteracted during the summer by the areas of low pressure in the interior tending to set up an indraught from the west. That indraught is, however, mostly feeble, and the rainfall is consequently so scanty, except in very low latitudes, that those coasts are almost unpeopled, one consequence of which is that there are no rainfall stations to furnish typical curves.

The foregoing account of climatic conditions has been written in terms of what must now be called the old meteorology. The newer concept pays less attention to pressure and winds and considers rather the movement of air-masses of varying characteristics. The air-masses may meet along fronts and such fronts are marked by atmospheric disturbances. In particular the polar front marks the outer limit of the mass of cold heavy air over the polar regions. What has been called the intertropical front, where the air-masses associated with the north-east and south-east trades meet, is now referred to rather as a zone of convergence.

Enough has been said to indicate that climatic conditions vary widely from one part of the world to another not only in the amount and season of rainfall, the degree and degree of variability of temperature, but also in many other ways. At the same time identical or almost identical climatic conditions recur in several parts of the world—it may be in equatorial Africa, South America and the East Indies or it may be (with the seasons reversed) in the South Island of New Zealand and in Scotland. The important conception of 'major climatic regions' was introduced to British geographers by the late Professor A. J. Herbertson of Oxford. His regions were based on conditions both of temperature and rainfall. The Herbertsonian regions, or modifications of them, are widely used, though in America greater use is made of the climatic regions devised by the German climatologist, W. Köppen. Köppen's regions are defined with greater rigidity and delimited by arbitrarily chosen temperature limits which sometimes have little corresponding precision on the ground. Another mathematically precise classification introducing the idea of 'precipitation efficiency' rather than actual rainfall has been introduced by the American climatologist, Thornthwaite. On the other hand, the American ecologist, F. E. Clements, has stressed the importance of plants as indices of the

whole complex of significant climatic factors so that the observed natural vegetation becomes the best indication of a climatic region.

The importance of the concept of climatic regions in commercial geography is in the applicability of lessons learnt in one part of a given region to all other areas having an identical climate. The climatic conditions of parts of Canada are repeated exactly in Russia, and so lessons learnt by scientific experiment in the one area can be applied in the other. If the Canadians are very successful in breeding a new type of wheat which will ripen farther north and with a shorter summer than existing varieties, the results of these experiments are immediately of great value to the Russians. On the other hand, serious mistakes have often been made in the past in trying to transfer customs or procedure from one part of the world to another where they are not suitable. Thus some of the early English settlers in Ceylon saw no reason why they could not grow the crops which they had grown in England, so they took with them oats and barley and wheat and tried to grow them. When the Pilgrim Fathers went from some of the country districts of England and settled in New England they cleared the forests and built for themselves homes and cultivated the ground believing that they had the same soil and climatic conditions as they had left behind them in England. There are many areas where they settled where the soil was very poor, and to-day much of the land that they so laboriously cleared is being abandoned; it is not good enough, and really has never been good enough, for cultivation.

Many important commercial products can only be produced in one type of climate. The rubber-tree (*Hevea*) is a native of the climatic region of the Amazon basin of South America where it is always hot and always wet; the rubber-tree cannot be grown where there is a long, dry season or where there is a cold season, but it can be grown in all those parts of the world where the climatic conditions are the same as in its own home area. Indeed, nearly all the natural rubber of commerce comes to-day from gigantic plantations in Malaya, Indonesia, and Ceylon. Plantations were started near Calcutta, but a long dry season there makes the cultivation of *Hevea* impossible.

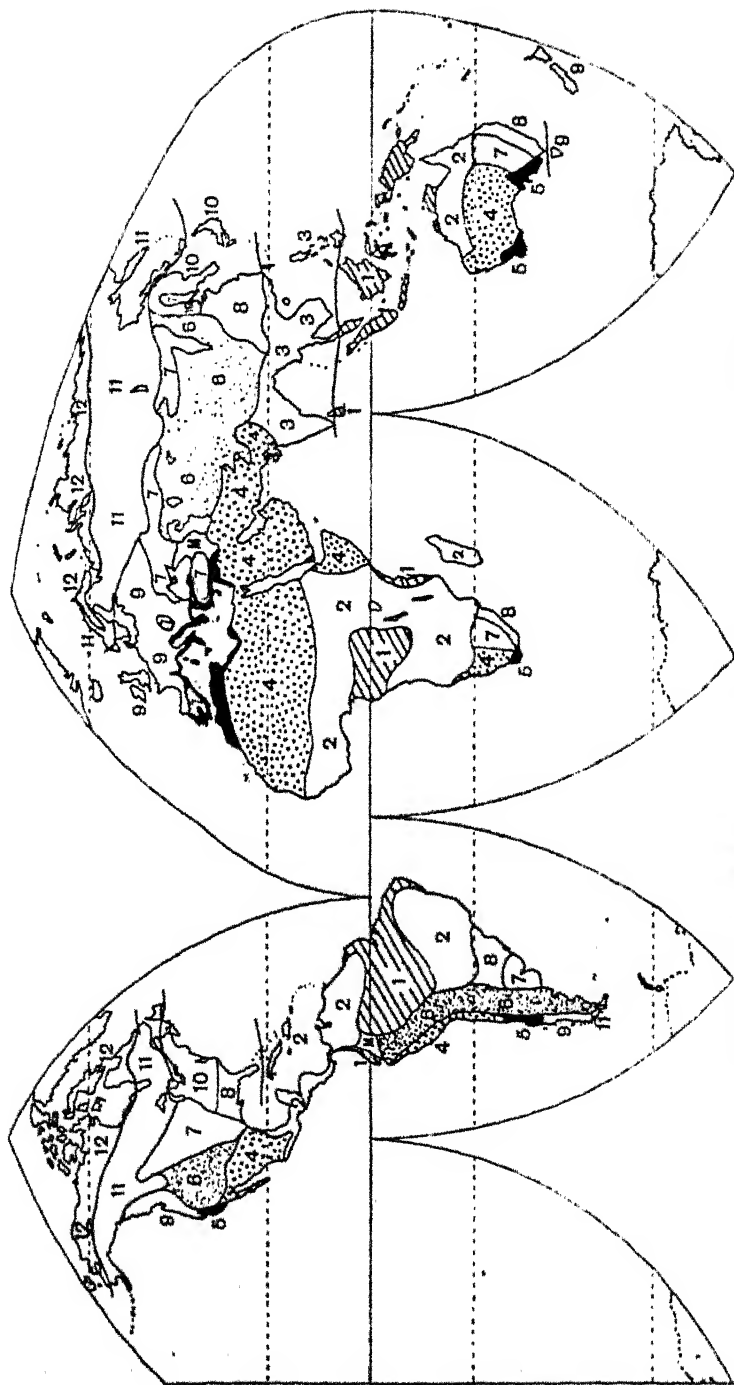
(a) CLIMATIC REGIONS OF LOW LATITUDES

The Equatorial Regions.—The Equatorial Climate (Köppen's AA'r) is found in a belt on either side of the equator, extending roughly between 5° north and 5° south of this line. The characteristic vegetation is tall, evergreen forest where it is always wet and always hot so that the forests are never leafless. It might be called also the climate of the hot, wet *selvas* (using a local name for the Amazon forests). The temperature is high all the year; there is

very little variation between the hottest month and the coolest month, and there is usually quite a small difference between day and night. The average for the year is about 78° or 80° F., and the range between the hottest and coldest month is usually less than 5°. Although the atmosphere is always hot and steamy and the temperature is uniformly high, the thermometer very rarely rises above 100° F. and frequently does not rise above 90°; on the other hand, it does not as a rule fall much below 70°. In the interior of the great forests there is little movement of the air, the climate is very tiring, but in situations near the sea or on islands it is often very pleasant, for the land and sea breezes give a welcome movement of the air—a cooling sea breeze by day and a land breeze by night. The rain falls at all seasons of the year and there is no dry season except in relative amount. In the early part of the day bright sunshine causes much evaporation and an upward current in the atmosphere; the ascending moisture-laden air becomes cooled and clouds form during the afternoon. The convectional rain which follows is often accompanied by thunder and falls in torrential downpours, usually of short duration. By the evening the sky is clear again. There are usually two seasons in the year which are wetter than the rest; in most cases the rains are at their maximum a short while after the period when the sun is shining vertically. Typical of the equatorial lands is the Belt of Calms or Doldrums where there is no marked wind or wind direction. Island stations have light and variable breezes but some regions near the equator are influenced by the trade-winds or monsoon-winds which are typically developed farther to the north or farther to the south. The equatorial region is nearly everywhere one of heavy rainfall, about 80 inches of rain a year being typical. There are three main areas: the Amazon basin of South America; the Congo basin of Central Africa; the islands of South-Eastern Asia and the neighbouring parts of the mainland, including Malaya.

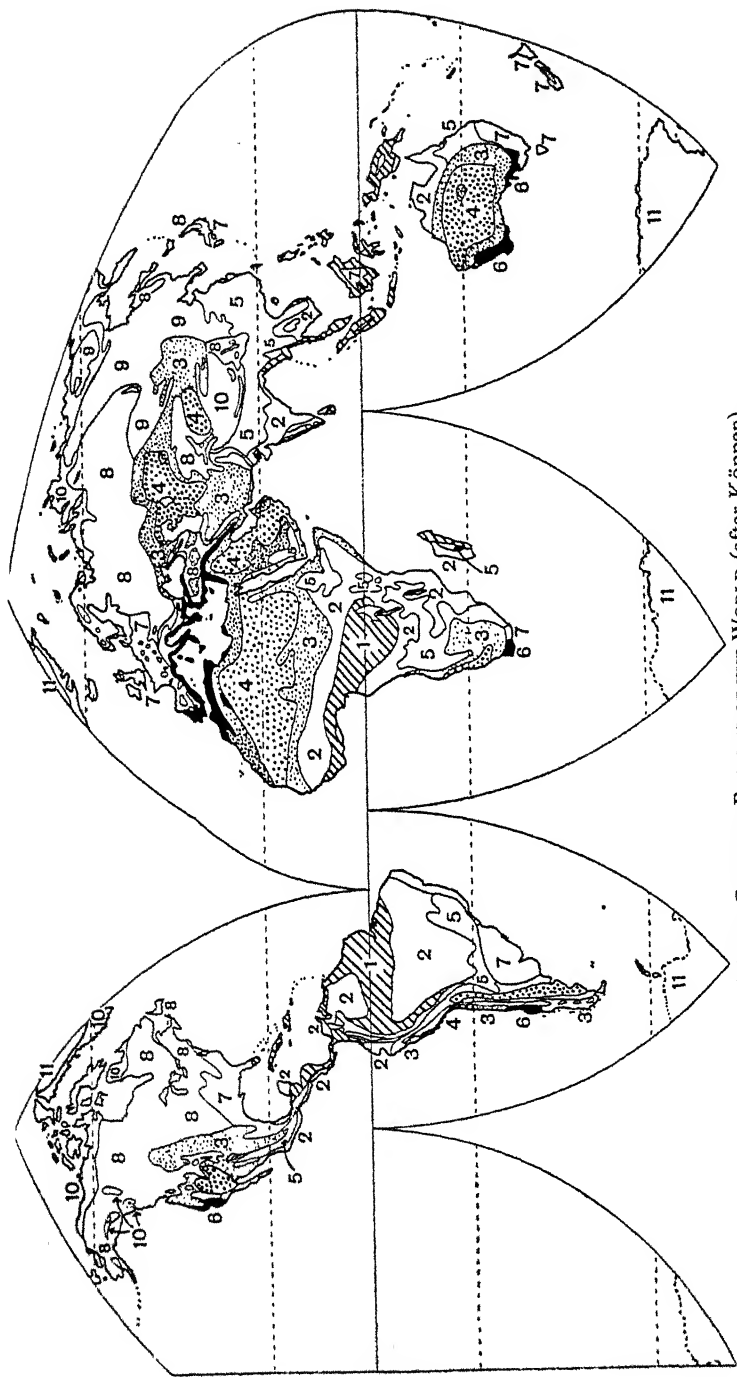
In high plateaus near the equator the temperature is very much lower and so the 'Ecuador type' of climate is found, typically on the high plateau of Ecuador at an elevation of 8,000 to 10,000 feet. Here the average temperature is only 55°, and this has been described as the 'land of eternal spring.'

There is a fierce struggle in the forest, not for moisture of which there is an abundance, but for air and light. Giant trees, nearly all having tall unbranched bolls with a crown of leaves at the top, form a close mass often so thick that little sunlight reaches the ground. Many of the trees are of hard-wooded species and there are two major difficulties in exploiting these forests. One is the great variety of trees, so that the extraction of one or more particular types of timber is extremely difficult. The other is the character of the timber itself—usually hard and costly to work



MAJOR CLIMATIC REGIONS OF THE WORLD (after Herbertson, modified by Stamp).

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| Climatic Regions of Low Latitudes | <ul style="list-style-type: none"> 1. Equatorial. 2. Tropical. 3. Tropical Monsoon. 4. Hot Desert and Semi-Desert. | <ul style="list-style-type: none"> 5. Mediterranean. 6. Temperate Desert and Dry Land. 7. Mid-Latitude Grassland. 8. East Coast Margins. | <ul style="list-style-type: none"> 9. Deciduous Forest. 10. East Coast Margins. 11. Coniferous Forest. 12. Tundra. |
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MAJOR CLIMATIC REGIONS OF THE WORLD (after Köppen).

<p>A. Tropical Rain-Climates.</p> <p>1. Hot Wet Forest Climate.</p> <p>2. Periodically Dry Savana Climate.</p>	<p>B. Dry Climate.</p> <p>3. Steppe Climate.</p> <p>4. Desert Climate.</p>	<p>C. Warm Temperate Rain-Climates.</p> <p>5. Warm Winter-Dry Climate.</p> <p>6. Warm Summer-Dry Climate.</p> <p>7. Cool Temperate Climate.</p>	<p>D. Boreal Climate.</p> <p>8. Damp Cold Winter.</p> <p>9. Dry Winter.</p>	<p>E. Snow Climate.</p> <p>10. Tundra Climate.</p> <p>11. Frost Climate.</p>
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though often forming magnificent 'cabinet' wood. Some towns such as Manaus in the heart of the equatorial forests of South America actually import softer, more easily worked, building timber from the timbered regions of North America. The struggle for light and air has resulted in the existence of large numbers of woody climbers; the trees by which these have climbed may afterwards decay and leave the climber hanging from the branches of neighbouring trees and the coils forming tangled masses on the ground. This is one reason why the equatorial forests are so difficult to penetrate. Many smaller plants, including orchids and ferns, find a foothold in the higher branches of the trees (growing there as 'epiphytes') and thus reach the light. In the denser forests the ground may be almost clear of vegetation except decaying matter, but in open forests there is a luxuriant growth of broad-leaved herbs. In the denser forests the animal life is almost restricted to the treetops and all groups of animals can exhibit members especially adapted to this particular habitat. Where man is concerned the equatorial climate has been well described as a good servant but a bad master. In the dense forests of South America and much of the Congo the climate is still the master; and the forests are sparsely inhabited by races backward both physically and mentally. On the other hand, the Malays and the Javanese enjoy a life of comparatively high culture. The white man has made the equatorial climate his servant, particularly in Malaya, Ceylon, and the East Indies. The forests there have given place to plantations of rubber, oil-palm, tea, and coffee. For the white man, too, these are far from being the unhealthiest or most uncomfortable parts of the world. The great danger is the absence of variation in the climate.

The Tropical Regions and the Tropical Monsoon Regions (Köppen's Awg).—The word 'tropical' is commonly used in such a loose way that it conveys little more than the idea of heat, but geographers have assigned a more precise meaning to the word tropical as applied to the tropical climate. The tropical and tropical monsoon climates are found typically within the Tropics on either side of the equatorial belt—that is, beyond 5° N. or S. of the equator. In contrast with the equatorial regions there is a marked difference between the temperatures of the hot and cool seasons of the year. Near the equatorial belt or in maritime situations where the rainfall is heavy, the difference of temperature may be small, but in other parts there is frequently as much as 30° or 40° between the hottest and the coldest months. The difference between day and night temperatures is correspondingly large.

The tropical regions lie between the equatorial forests on the one side and the hot deserts on the other. From the point of view of rainfall there is a gradation from 80 inches a year or more on

the forest edge to 15 inches on the other edge; at some of the wettest stations in the tropical belt the rainfall may be as much as 200 inches a year. There is, however, a distinctly dry and distinctly wet season, and it is usually possible to distinguish between (a) a cool dry season followed by (b) a hot dry season, when the land becomes greatly heated and the highest temperatures are recorded, and (c) the rainy season.

With the coming of the rain begins a lowering of temperature, but the rain comes in the hot season of the year, while the cooler months are practically rainless. This season of intensive rainfall favours the growth of grass, but where there is sufficient moisture to give a constant underground supply trees also flourish. Thus in tropical and tropical monsoon lands four belts of vegetation may be distinguished: (a) Near the equatorial belt, provided the rainfall is sufficiently heavy, there is forest differing but little from that of the equatorial belt. (b) Where the rainfall drops below about 60 or 80 inches this passes into a forest in which the trees are deciduous, losing their leaves or having a resting period during the heat of the year. The forests of Burma and parts of India famous for their teak, sal, and other timbers belong to this region, as do many of the forests of West Africa. (c) Then comes the characteristic grassland of so much of Africa, the great stretches of grassland with occasional trees, or savanna. In India, where it is too dry for the growth of monsoon forest, its place is taken by rather a scrubby kind of woodland with a limited amount of grass. (d) Towards the desert areas the vegetation becomes poorer and poorer, the trees are replaced by spiny bushes and the grass is found only in sparse tufts.

In the drier parts the reliability of the rainfall from one year to another is a serious matter. Some years the fall is sufficient to ensure good crops, whilst in other years a poor rainfall results in famine conditions.

The animals are of two main groups—(a) the swift-footed, vegetable-eating animals such as the antelope and giraffe that take refuge from their enemies in flight; (b) the carnivores such as the lion and the leopard which prey upon the members of the first group.

Man in the savanna is primarily a hunter; just as the grassland is able to support vast numbers of grass-eating animals, so man is able to rear great herds of cattle and so becomes a pastoralist. The natural grass which flourishes in the savanna may be replaced by the cereal grasses and so man becomes an agriculturist. The more important crops of the tropical regions, like the occupations of man, vary (a) with the amount of rainfall, and (b) with the degree of development. India affords an example of a very densely populated region and Africa or parts of South America of the more sparsely populated tracts.

In areas with more than 80 inches of rain a year rice is the staple food of the people and almost the only crop, as in India. The main danger is not a lack of water but one of flooding; protective works are often necessary to prevent floods.

In areas with between 40 and 80 inches of rain a year rice is again an important food crop, largely replaced by maize in Africa, while sugar and oil-seeds are other important crops.

In areas with between 20 and 40 inches of rain (dry belts) the land is normally covered with scrubland, thorn forest or grassland; different types of millet or Guinea corn are the staple grains of the people as in all the warmer parts of India and in tropical Africa, though in regions such as northern India wheat and barley may be grown as winter crops; in India, indeed, the wheat crop is from a third to a half as large as the rice crop. Sesamum and various oil-seeds are cultivated and cotton is a characteristic crop. There is always the danger that the rain may be less than average and that famine may thereby result.

In the tropical regions cattle are reared in numbers and in Africa form virtually a measure of wealth of individuals or tribes. Unfortunately quantity rather than quality is the criterion adopted. In many parts of Africa the destructive tsetse fly is very much in evidence and limits cattle rearing. Sheep may be important, as they are in India.

The Hot Desert Regions (Köppen's BW) lie on the poleward side of the regions with a tropical or tropical monsoon climate. They are confined to high-pressure belts where the currents of air are descending and the winds blow outwards so that there are no moisture-laden winds coming in from the ocean. They are mainly on the western side of the land masses because on the eastern side a certain amount of rain is caused in these latitudes by the trade-winds. In the hot desert regions there are few clouds and the sun pours down with unmitigated force on the unprotected soil, while the absence of cloud also permits rapid radiation of heat and the nights are often very cold. There is thus a big contrast between day and night and between the hot season, when the sun is vertically overhead, and the cold season. There is further little or no rain to exercise a cooling influence on the temperature; many of the deserts are low-lying so that there is not even altitude to temper the heat of summer, with the result that the highest temperatures of the world are recorded in these regions. Thus, El Golea in the Sahara has an average temperature of 93° in July, whereas in January its average is only 39°, about the same as London for the same month. Jacobabad, in Sind (Pakistan), has one of the highest recorded average temperatures in the world for the month of July—98° F. On the margins of the desert nearest the equator the desert proper fades into semi-desert as soon as the rainfall

reaches 9 or 10 inches a year; this in turn passes gradually into the grasslands of tropical regions. On these margins of the deserts such rain as does fall comes mainly in the same season as it does in the tropical lands, that is to say, in the early summer. On the poleward margins, on the other hand, the desert fades gradually into Mediterranean scrubland where the rain comes in winter. Cairo with 1·3 inches of rain a year is an example of this type. The largest deserts occur in the Northern Hemisphere, for the simple reason that the land masses are there broader. The great Sahara stretches almost continuously from the Atlantic to the Red Sea and then eastwards over Asia to the borders of Baluchistan and the great Indian desert. North America has the deserts of the Mexican and United States borders, South America the Peruvian and north Chilean deserts that occupy the area between the Andes and the Pacific Ocean. In South Africa the Kalahari Desert stretches right to the Atlantic Ocean, whilst in Australia a large area has a rainfall of less than 10 inches a year, the great dry heart of the continent.

There are few deserts where absolutely nothing grows; over much larger areas there is some vegetation, often sufficient to support at least some animal life. The plants have various means of storing water; some have very long roots which go down to great depths and so find water, others have special stems and leaves in which water can be stored up, while many are provided with spines and thorns to prevent their being readily eaten by animals. Of special importance are the fertile areas or oases occupying hollows where an underground supply of water comes sufficiently near the surface to be accessible to vegetation. Some oases may consist merely of a clump of trees surrounding a pool or well, where the typical tree is the date-palm, but other and more important oases are areas of several hundred square miles and may support a big population as in the heart of Arabia.

The sparse population of the deserts falls into three groups: (a) the wanderers who move about from place to place, in the old days with camels, or for shorter journeys with mules, and act as carriers of goods from one desert margin to another, or at other times form bands of nomadic robbers; (b) the settled people of the oases who devote themselves to growing grain, rearing cattle, sheep, goats, horses and camels, and the cultivation of such desert plants as the date-palm—to this group belong many of the Arabs; (c) the settled population of miners, attracted by mineral deposits independently of climatic conditions, as for example in the nitrate fields of northern Chile or the goldfields of Western Australia.

In the desert regions some interesting influences of climatic conditions on man can be traced. The desert has often produced people with a philosophical outlook, such as the ancient Egyptians and the Arabs, learned in Mathematics and Astronomy. Over long

periods the inhabitants of oases may live peacefully and happily, but the result of a dry year, or especially a succession of dry years, or the failure of the underground water supply, is to drive the inhabitants abroad in search of other means of sustenance. Many racial migrations due to these factors may be traced in the pages of history; the arrival of the Shepherd Kings in Egypt, the wanderings of Abraham which led him to the Promised Land, the recent migrations in Arabia and the troubled politics of that country, may all be traced to these causes.

On the whole deserts have acted as barriers to civilisation and to the movement of human beings. The Sahara still separates the white and negro races of mankind; through the centuries it has been more difficult to cross than even the open ocean.

(b) CLIMATIC REGIONS OF MIDDLE LATITUDES

Outside the tropics there is usually a considerable difference between the western and eastern margins of the great continental masses. On the western margins the Mediterranean type of climate passes inland with decreasing moisture to mid-latitude desert regions, or in certain areas to grasslands, the so-called temperate grasslands which are characteristically found in the interiors of continental masses. On the eastern margins again is another type of climate.

The Mediterranean Regions (Köppen's CSa).—One of the most distinctive and best known of all the climatic types is that known as the Mediterranean, which is characteristic of the lands surrounding the Mediterranean Sea. Like the hot deserts which border them on the side nearer the equator, these regions are hot and dry in the summer, with out-blowing winds: in winter, however, they come under the influence of the westerly wind belt and enjoy moist, mild winters. This is the typical winter rain climate, contrasted with the typical summer rain climate of the tropical or tropical monsoon lands, but the Mediterranean regions are outside the tropics and so on an average are cooler. Sunshine is a typical attribute of Mediterranean lands: almost cloudless skies in summer, and even in winter fewer clouds than would be expected.

The Mediterranean climate is restricted to the western sides of the continents, roughly between latitudes 30° and 45°. The largest area is that found round the Mediterranean Sea, while others occur in North America (parts of California), South America (central Chile), South Africa (south-western Cape Province), and Australia (south-west of Western Australia, South Australia, and part of Victoria). Here during the hot summer the trade-winds in all cases are blowing off-shore. A typical Mediterranean climate could not exist on the eastern side of a continent where the trade-

winds blow from the ocean and are moisture-laden. Within the Mediterranean region there is considerable variation in the details of the climate especially round the large Mediterranean Sea. Eastwards the winters tend to be colder, but the coldest month has usually an average temperature of over 40° , whilst in the more typical parts of Mediterranean lands the coldest month has a temperature of over 50° . The summers are both hot and dry with a mean temperature of over 70° , in many areas of over 80° . The rainfall varies but is usually small, between 10 and 40 inches a year in typical cases; on mountains with exposed situations it may be much higher.

The climate does not favour shallow-rooted herbs and grasses which require light showers during the spring and early season when they are growing; it favours, on the other hand, deep-rooted trees and shrubs which are able to withstand the long dry summer. Many of the trees have small leathery leaves or leaves with a coating of wax to retain moisture, others, such as the olive, have leaves covered with fine silky hairs, all of which devices are designed to prevent excessive loss of moisture through transpiration in the hot summer. Some of the plants, such as the vine, have exceptionally long roots. In those regions where forests occur, even forest trees are specially protected; the thick bark of the cork-oak of Portugal is an example of this. The dry summer conditions of Mediterranean lands are ideal for the ripening of fruit; the typical ones are the citrus fruits (oranges, lemons, and grapefruit), together with a great variety of fruits from trees which lose their leaves in the winter, such as peach, pear, apricot, and apple as well as the olive, almond, fig, mulberry, and vine. Of grain certain types of wheat and barley will grow well, having been adapted by man to the climatic conditions. Deficiency of rainfall is often a serious drawback, and so irrigation has played a large part in many Mediterranean regions. The Mediterranean lands have harboured many of the great civilisations of the world, Greece and Rome, Crete and Carthage.

The Mid-latitude Desert Regions (Köppen's BWk).—The middle latitude deserts cover enormous areas in the heart of the land mass of Eurasia and considerable tracts of the heart of North America, but in South America they are represented only by the Patagonian Desert. In the Northern Hemisphere they occupy flat areas cut off from the ocean by mountain barriers and by distance. In general the mid-latitude deserts are characterised by wide ranges of temperature and a very low rainfall. Generally, too, they form large areas of high pressure with great masses of cold air in winter and areas of low pressure with in-blowing winds in summer. The scanty rainfall occurs mainly in the summer except in those regions which border the Mediterranean countries—*e.g.* Iran.

Elevation and latitude permit of a subdivision of mid-latitude

deserts into several types: (a) The *Tibet type* occurs on the high plateaus of Central Asia, over 11,000 feet, and in Bolivia in South America, again over 11,000 feet. Many parts of the Bolivian plateau are almost too well watered to be described as desert. (b) The *Iran type*, characterised by the enclosed plateau of Iran or Persia, forms a transition to the hot desert type. Similar areas occur in North America round Salt Lake City. (c) The *Gobi or Mongolian type* occurs at lower elevations farther away from the equator.

Mid-latitude Grassland Regions (Köppen's BSk).—The mid-latitude grassland regions are also called the Temperate Grasslands or the Temperate Continental Regions, but the word 'temperate' is an unfortunate one because it is in these regions that great contrasts are found between summer and winter.

There are great tracts in the heart of the land mass of North America and the land mass of Eurasia which are far removed from the moderating influence of the sea. There are no cooling sea-breezes to counteract the extreme heat of summer, nor are there warm ocean currents and pleasant westerly winds to mitigate the extreme cold of winter. When the land becomes heated in spring, low-pressure areas form and air-masses from the ocean come sufficiently laden with moisture to bring a moderate rainfall. This rainfall comes mainly in the spring and summer, and affords conditions more suitable to grass than to trees. So in these regions are found the great mid-latitude grasslands of the world—the Prairies of North America, the Steppes of southern Europe and southern Siberia. The winters are very long and very severe, the summers short but hot. Average temperatures below 0° F. are common in winter, but the three hottest months usually have temperatures over 60° and frequently over 70°. In the Southern Hemisphere the land masses are so much narrower that the extreme continental type does not occur. In South America, however, the Pampas, cut off by the high Andes from the westerly winds of the south Pacific, enjoy a comparable though much more moderate climate. In South Africa grassland is found on the surface of the lofty South African plateau. Here temperatures are much higher, snow being a rarity, and the existence of the grasslands is due largely to elevation. The Murray-Darling basin in Australia has also a modified continental grassland climate.

The grass is usually lower and less coarse than in the tropical grasslands, and the rolling plains are usually treeless. The contrast between the tender green of the spring, the brown, dried-up wastes of late summer, and the boundless sheet of snow in winter is characteristic of these regions of the Northern Hemisphere. The animals, as in the Tropical Grasslands, are divided into grass-eaters, swift of foot to escape from their enemies, and the carnivores, amongst which man must really be classed.

Primitive man, as a native of the grasslands, is primarily a hunter, as were the Red Indians of the Prairies. The second stage in human development comes with the domestication of such animals as the sheep and goat, the ox and the horse. Pastoral industries become of supreme importance, and man is nomadic, wandering about with his flocks and herds in search of fresh pastures. Droughts and a consequent shortage of pasture have repeatedly led, throughout history, to great movements of these nomadic peoples and raids on the settled population of surrounding lands. It is interesting to note that in the grasslands of the Southern Hemisphere the rearing of sheep is still the first industry, as in Australia, South Africa, and parts of the Argentine. In Canada and Russia the extremes of winter cold are too severe for sheep rearing to be really successful; but a climate so favourable to native grasses has naturally proved favourable to those grasses which man has helped to perfect as the main cereals. These grasslands have become the world's granaries, from which the deficiencies of the industrial countries are made up. Except in South Africa, where maize is the leading cereal, wheat is the crop of first importance in international commerce, followed by barley, oats, and rye. The Prairies, the Pampas, the Veld of South Africa, and the Downland of Australia are already well tilled; but there are still areas to be developed in Soviet Asia. One large area of rather dry grassland remains undeveloped in Mongolia and Manchuria, where Chinese settlement is penetrating gradually along the fringes.

In the grasslands of the Southern Hemisphere, particularly in the Argentine and Uruguay, cattle rearing is important; but there is a distinct tendency for 'bread' to oust 'meat' in the competition for these lands. There are no longer the numerous huge ranches that formerly existed; they are being broken up, and wheat-farming becomes of greater importance. Hence the need for finding new lands for meat production, and the utilisation of the Tropical Grasslands.

East Coast Margins (Köppen's CW).—On the eastern side of the land masses in the same latitudes as the Mediterranean lands of the western side there are regions which in temperature are roughly comparable, but where the rainfall comes mainly in summer. These regions are sometimes called the Warm Temperate Regions, but actually again the word 'temperate' is not very descriptive because of the contrasts which are often found between summer and winter. Nor is there one actual type of climate; any one of the particular regions has its own particular features and the areas are (a) the south-eastern states (the cotton lands) of the United States of America, (b) the greater part of China, (c) the south-eastern coastlands of Australia, and (d) of South Africa, and (e) the region of Uruguay and south-eastern Brazil in South America. The south-

eastern United States have a well-distributed moderate rainfall throughout the year, usually with a maximum in the latter part of the summer, when the rain-bearing winds from the ocean flow in towards the low-pressure areas created by the heat in the interior of the continent. The economy of this region is almost entirely bound up in the production of cotton. Central and northern China form part of the great 'Monsoon' region of Asia. The climate differs from that of India and southern China in the coldness of the winters. The rainfall, like that of India, is due to the development of a low-pressure centre, towards which rain-bearing winds from the ocean blow. While India is protected from the cold winds in winter by the Himalayas, China is not so fortunate. Bitterly cold winds blow outwards from the heart of Asia towards the sea throughout most of the winter, bringing the temperature over much of the country down to freezing-point or below. The temperature of Peking is well below freezing in January. Snow falls commonly over the greater part of central and northern China. The summers, however, are both hot and wet, favouring the growth of rice in the south, whereas millet and wheat are the principal grains farther north. Cotton is a leading crop in central China.

In the three continents of the Southern Hemisphere, climatic conditions in the three corresponding regions are somewhat similar (Eastralian type of eastern Australia). The rainfall is well distributed throughout the year, with a summer maximum derived mainly from the trade-winds. But the southern continents are not broad enough to develop large high-pressure centres in winter with cold, out-blowing winds; so the southern regions are much more temperate and have very much milder winters.

Though the natural vegetation varies from country to country high forest is typical: evergreen where the rainfall is sufficiently well distributed. These 'Rain Forests' often exhibit a luxuriance of growth rivalling the equatorial forests, but they are more open. Palms and tree ferns are noteworthy in many areas. In the Gulf States there are both broad-leaved and coniferous forests; from the latter the well-known pitch pine is obtained. China has been very extensively cleared of her natural vegetation, so that it is very difficult to know what was the original forest cover. It should be mentioned that Japan has this type of climate, but in her case the conditions are modified by the position of the country as an archipelago. Sufficient has been said to indicate that these regions are eminently suited to human occupation and development. The valleys of central China, with their rice, cotton, tea, and silk, resemble Monsoon India, or rather exceed it, in their density of population, and include the most densely populated agricultural tracts of the whole world. The density may be upward of 3,000 to the square mile—3,000 people who find their sustenance throughout

the year from the small tract of land afforded by one single square mile. The Gulf States of America are the world's storehouse of cotton with the Maize Belt immediately to the north. The eastern coastal strip of Australia and the warm coastal belt of Natal have both attracted relatively large populations. There are considerable untouched forest areas, however, in the interior of South America—untouched largely because they are swampy and unhealthy.

(c) CLIMATIC REGIONS OF HIGH LATITUDES

The Cool Temperate Oceanic Regions (Köppen's Cf).—On the western margins of the continents on the poleward side of Mediterranean lands are regions which lie constantly in the belt of the variable westerly winds—once called the 'Anti-Tradewinds'—and so are under the influence of cool, rain-bearing winds from the ocean the whole year. The two characteristics, small range of temperature between summer and winter and a well-distributed rainfall throughout the year, are at once obvious. The westerly winds do not blow as steadily as the trade-winds, but rather as a succession of eddies and whirls—cyclones and anti-cyclones. Residents in north-western Europe know well the prime importance of the cyclones and anti-cyclones in determining local weather conditions. The largest area having this type of climate is north-western Europe, but British Columbia and the north-western United States form another important area. In the Southern Hemisphere there is a small tract in southern Chile, but no part of Africa lies sufficiently far south, whilst in Australasia only Tasmania and New Zealand (especially the South Island) are typical. In Europe, owing to the drift of warm water which is the continuation of the Gulf Stream, the mild winters characterising this type of climate extend exceptionally far north, there being no land barriers. Conditions are most truly oceanic, that is, the annual range is least, near the western coasts. The winters become steadily colder as one goes eastwards and the summers slightly warmer; so it is customary in Europe to distinguish two subdivisions: (a) the North-West European type, where the average temperature of the coldest month is above freezing—averaging about 40°; (b) the Central European type, where the average temperature of the coldest month is about or below freezing. The rainfall is well distributed throughout the year, but the total amount varies somewhat widely. In the west the mountains are the wettest part, the plains, lying to the east of the mountain ranges, are the driest. Some parts of the British Isles have a rainfall of over 80 inches, as in the Lake District, whilst in the east of England the rainfall drops to little over 20 inches, and is as low as 18 inches in eastern Germany.

This so-called Cool Temperate climate is the natural home of

the Temperate Deciduous Forests. The delicately tissueed leaves are easily injured by winter frosts, and the trees have made the winter their resting period. The very name of the 'fall' of the year, though replaced in England by the less descriptive 'autumn,' is indicative of the marked nature of the phenomenon of leaf fall. Many of the trees of these forests (see p. 236) yield valuable hardwoods, more easily worked than the timbers of equatorial lands, but hard relatively to the softwood timbers of the coniferous forests. Well-known examples are the oak, elm, maple, beech, and birch. Deciduous forests formerly covered most of north-western and central Europe, only interrupted by highlands clothed with evergreen forests or by tracts of moorland and heathland. In North America the mixture of several species of evergreen conifers—usually predominant—gives the forests a somewhat different aspect.

The Cool Temperate climate is the one perhaps most favourable to the development of the human race. It is sufficiently cold to necessitate manual work for the maintaining of bodily warmth in winter, but the summers are never so hot as to make outdoor work unpleasant. Individuals and races seem to develop somewhat more slowly than in tropical climes, but their maturity is more permanent when it is attained. Many of the great industrial countries of the world—Britain, France, Germany, Belgium, and the Netherlands—are situated in this region. Over the greater part of Europe the natural vegetation—the forest—has been cut down to make room for agricultural, pastoral, and industrial development. All the important temperate cereals—wheat, barley, oats, and rye—flourish, at any rate in the drier parts, with maize in the warmer parts. The natural fruits include apples, pears, and a number of others. In the drier regions sheep flourish on the hill-pastures; in the wetter areas the grass grows richly and affords excellent pasture for cattle. The corresponding area in North America is equally suited for development except that much of British Columbia is too mountainous for settlement; and in the deep valleys which separate the mountain ranges the rainfall is often extremely low, some parts getting no more than about 5 inches a year. The mild winters of such places as Vancouver form a pleasant and interesting contrast to the severe winters of the prairies of the heart of Canada. New Zealand—sometimes called the Brighter Britain of the South—forms an interesting example of modern development in the Southern Hemisphere of this type of climate. Only Chile's area, with too great a rainfall and too great an extent of mountainous country, remains undeveloped.

East Coast Margins (Köppen's DW).—The eastern margins of the great land masses are far colder in winter than the corresponding western margins. Many of the ports, *e.g.* Montreal and Vladivostok, are ice-bound, though the summers are hotter than in

corresponding latitudes on the west coasts. In the north-eastern United States, the Maritime Provinces and the St. Lawrence valley of Canada, there is a well-distributed rainfall which permits of dairy and arable farming. The corresponding region in Asia, in Manchuria, is a region where the monsoon winds still play their part; so it is the summers which are hot and moist, the winters extremely cold and almost rainless. The land masses of the Southern Hemisphere are not sufficiently broad for this type of climate to be developed.

The forests which normally clothe the two regions of the Northern Hemisphere are of mixed deciduous and coniferous species. The industrial development of those portions of the United States which fall in this tract and of the corresponding parts of Canada is such that they are no longer self-supporting in the matter of food-stuffs. The same development has not yet taken place in the Asiatic regions; indeed, Manchuria is a tract as yet considerably undeveloped. It is obvious that if such a wonderful result may be attained with this type of climate in America, there are vast possibilities in the future for Manchuria.

The Cold Temperate or Sub-Arctic Regions (Köppen's Dfc).—Stretching across the Northern Hemisphere as a broad belt is a region whose average temperature is low and where the greater part of the somewhat scanty precipitation is in the form of snow. The natural vegetation is everywhere of the evergreen, coniferous forest type. The really distinguishing feature is the shortness of the summer—insufficiently long for the ripening of cereals. Certainly a little oats and barley are grown, but the region is beyond the economic limit for the cultivation of wheat. In most typical stations only one month rises above 60°, and in many cases the annual average is below 40°. In certain parts near the ocean the range of temperature between summer and winter may be comparatively small, but in the heart of northern Asia there is actually a range of over 100° F.—the greatest in the world. A similar type of climate occurs on mountain ranges throughout Europe and North America. In the Southern Hemisphere only the extreme south of South America and the mountains of New Zealand have a climate sufficiently cold to belong to this type. Where agriculture is so little favoured, natural vegetation remains important. The peculiar structure of the thick-skinned resinous leaves affords adequate protection both against cold and excessive loss of moisture. The finest tree growth is in the warmer southern parts of the sub-Arctic belt; northwards the trees become scattered and smaller or grow but slowly. Thus it takes fifty or sixty years for timber forests to regenerate in the southern margins, but up to two hundred years in the poleward tracts. The Coniferous Forests, or Taïga, are the world's great storehouse of softwood timber, such as pine, fir, and deal. The great belt of forest

stretching across North America is the most important in the world; in Europe there are the forests of Scandinavia and northern Russia, whilst the same type reappears in the hills and mountains of north-western and central Europe. Across the north of Asia, that is in Siberia, the forested areas are largely inaccessible and suffer from the peculiar physical conditions of the land. The great rivers there flow northwards towards the frozen Arctic Ocean, and are themselves frozen throughout the winter. In the spring the upper courses in the warm south melt, whilst the central and lower courses are still ice-bound, with the result that flood-waters spread far and wide over the flat country and turn the 'Taiga' into a vast forested morass. This is reflected in the poor condition of much of the timber.

The sparsely inhabited and less accessible regions of the Coniferous Forests are occupied mainly, before development, by hunters and trappers, for the animals of the northern forests are protected from the cold by thick fur. The main fur-producing tracts are round Hudson Bay in Canada, and in the forest regions of Siberia. In the economy of a civilised world, logging and timber-working industries take first place in these tracts, the production of wood-pulp for paper being not the least important of the uses of coniferous wood. The trees are felled during the winter, dragged over the slippery snow to the water-courses, and floated down the rivers when the snows melt. Accessibility, the presence of streams suitable for floating, and the existence of water-power for saw-mills and pulping-mills are the factors influencing development. By far the most important areas are along the southern fringes of the forest in eastern Canada and in the countries of northern Europe. The influence of the abundance of easily worked wood is seen in the dwellings in the forested regions, from the rough log cabins of the Canadian backwoodsmen, the timber-workers of Finland and northern Russia, to the elaborate wooden chalets of the Swiss mountain forests.

The softwood forests of the smaller countries of Europe have been worked so long that it is difficult to maintain an output of timber and wood-pulp, and certainly almost impossible to increase that output. The only two countries in the world which still have very large reserves of softwood are Canada and the U.S.S.R.

The Cold Desert or Tundra Regions (Köppen's E and F).—Within the Arctic Circle the winters are very long and very cold—there are at least some days on which the sun never appears—whilst the summers are very short though warm. Though for certain periods the sun never sets, it never rises far above the horizon. It is too cold for forest; the natural vegetation is moss and lichen, with stunted bushes and small trees near the forest limit. Agriculture is practically impossible, for the ground is frozen for three-quarters of the year. The short, hot summer does, however, some-

times produce an amazingly prolific growth of grass and herbs, which can take advantage of the continuous sunshine of mid-summer; hence the introduction of the name 'Arctic Prairies,' substituted in Canada for the old term 'Barren Lands,' which scarcely does justice to the region. One of the great problems is the permanently frozen sub-soil or permafrost.

Though they are at present almost uninhabited, there seem to be future possibilities for the development of these lands, by the breeding of reindeer or caribou, the natural animal inhabitants, whose flesh and skins have a very definite economic value. Remarkable developments have taken place in Arctic Siberia, and the Russians have established several towns and numerous research stations.

Canadian-United States weather stations have been established in the Arctic archipelago north of the Canadian mainland, where the Tundra lands pass into regions of permanent ice and snow. The plateau of Greenland represents the ultimate development of the extreme type of Cold Desert climate. To this the Antarctic Continent corresponds in the Southern Hemisphere.

(d) HIGHLAND REGIONS

In ascending a mountain in the tropics we may be said to pass through, in a very broad and general sense, the main vegetation regions as from the equator polewards. Thus the tropical forests and grasslands give place upwards, very frequently, to a belt of hardwood trees, then to a belt of conifers above which come the alpine pastures which are the counterpart of the arctic pastures just described. There are other differences which are due to the effect of elevation and the consequent rarefaction of the atmosphere. From the point of view of commercial geography it is important to remember that, in a mountainous country, a wider variety of products can be grown than might otherwise be possible; thus on plateau regions in the tropics it is possible to cultivate crops which are otherwise only grown in temperate latitudes. It is possible too, as, for example, on the plateau of Kenya, for white settlement to take place in a region which would otherwise only be suitable for tropical agriculture.

From the causes indicated, population in most parts of the tropics is relatively scanty, and plantation products are mainly grown under the direction of Europeans, or (as in South America) people of European origin. Many of them are products of hill slopes at a greater or less elevation, such sites presenting combinations of soil and climate not to be found elsewhere. While the

temperature is more moderate than on the low grounds, it has all the uniformity characteristic of the tropics, and the slopes of tropical mountains exposed to warm ocean winds enjoy frequent and copious supplies of rain, combined with the advantage of excellent drainage, so that there is little fear of the roots of crops or trees suffering from excess of moisture. The only danger to be guarded against is the possibility of the soil being washed away from the roots at the same time. Indeed, soil-erosion is an ever-present problem.

To Europeans the residence on tropical hills is perhaps more healthy than residence on the low grounds in the same latitudes; but even at the elevation at which coffee is grown, a tropical climate is for them neither entirely healthy nor agreeable. The enervating effects of the heat and moisture render them unfit for work such as they could engage in with comfort in more temperate regions; and notwithstanding the uniformity of the temperature as indicated by the thermometer, the unpleasant sense of heat often alternates with as unpleasant a sense of cold, for the excessive moisture of the atmosphere renders one sensitive to variations of temperature which would scarcely be felt in a drier climate. Humboldt mentions in one place that he and his companions, after a short residence in the torrid zone, found that their senses had become so easily affected by the slightest change of temperature that they could not sleep for the cold on one occasion, even when they discovered, to their astonishment, that the thermometer indicated a temperature equal to 71° F. One of the authors has had similar experiences in Burma and elsewhere; after residence in Rangoon with average temperatures of 80°, night temperatures of 50° in the hills produced the feeling of intense and penetrating cold. An African traveller mentions that on the Senegal one could not expose oneself in the open air after sunset to a slight lowering of temperature without feeling the sensation of decided cold. In central Africa, within ten degrees of the equator, certain Africans keep themselves warm at night by spreading the mats that form their bedding on hollow clay benches heated by fires or glowing charcoal inside, just as is done in China.

In recent years much progress has been made in the study of medical climatology, especially in relation to clothing suitable for intense cold and great heat.

In the temperate zones not only is the temperature on the whole lower than within the tropics, but the variations in temperature are generally greater. As far as the more productive parts of the earth are concerned, it is chiefly in the temperate zones that frosts occur, and water-vapour is precipitated as snow. A snow-covering of longer or shorter duration is a regular annual occurrence in higher latitudes (from about 40° or 46° N., according to the locality), except in those western tracts which are most directly exposed to

the warm winds from the south-west. The deepest snows in cultivated regions are those which occur in the eastern provinces of Canada, where snow lies on the ground to a depth of from 3 to 5 feet. Both snow and frost may be regarded, on the one hand, as interruptions to field labour. Frost is also an interruption to communication by closing navigable rivers, and snow by blocking railways and roads. On the other hand, snow favours timber transport and sledge-travelling, and aeroplanes fitted with skis have overcome some of the difficulties of winter travel. To the native tribes of northern Siberia the aeroplane became a commonplace, even before they had seen a motor-car. In regions of scanty rainfall snow is in many parts of the world extremely important as a natural store of moisture for summer use, especially on mountain slopes, and all the more if forests are present to prevent its removal by gravitation. Elsewhere this store may result in injury by flood. Both snow and frost, moreover, must be recognised as beneficial to the soil, and hence favourable to cultivation. Snow, from being a bad conductor of heat (owing to the large proportion of occluded air), though it tends to preserve rigorous temperatures in the air above, protects the underlying soil against these rigours, and, when the time of melting arrives, saturates the ground with moisture, which brings vegetation rapidly forward. Frost, again, by expanding the water in freezing in every pore of the soil to which it reaches, pulverises the soil to an extreme degree of fineness, and thus enables the coming vegetation to send its rootlets to a great depth, and obtain in consequence all the greater nourishment.

Whether in the tropics or the temperate zone, physical exertion at a high altitude has an injurious influence, though the effect is different in different individuals. What is known as **mountain sickness** affects all who are subjected to hard muscular work above 10,000 feet. On the Oroya railway the time during which riveters were engaged did not average a week each. Many returned on the next train. Animals suffer in the same way. The cause appears to be a diminution in the supply of oxygen, bringing about an increase in the relative pressure of the carbon dioxide in the lungs, and thus a stimulation of the respiratory system. That may, on the other hand, be also the explanation of the favourable influence experienced by some at lower altitudes. Immigrants in Alberta at altitudes between 3,000 and 4,000 feet experience a stimulating effect of that region on their appetites as compared with their original British homes. These beneficial influences are readily explicable by a quickened respiratory action in the case of those whose hearts have the necessary vigour. On the other hand, immigrant settlers on the African plateau at similar heights sometimes find the need of spending holidays at lower elevations.

(e) UNDERGROUND WATER SUPPLIES AND TEMPERATURES

In connection with the subject of climate may be considered underground water-circulation and underground temperatures, inasmuch as both of these depend more or less upon climate, and both have to be regarded in some cases as influencing man directly or indirectly in the same way as climatic conditions. Everywhere at a greater or less depth water is present, saturating loose earth to the exclusion of air. The upper surface of this water-saturated layer, the level of which is indicated by the surface of water in wells, is known as the water-table, and its depth below the surface is determined by the amount and mode of precipitation and the rate of evaporation. The amount of water that penetrates to a sufficient depth to feed this layer varies according as the precipitation is in the form of fine or heavy rain, or of snow or hail, and according as the melting of snow or hail takes place when the ground underneath is frozen or not. The circulation of this underground water depends on the porosity of the rock and the slope of the water-bearing strata, which may differ greatly from the surface slope. It is from this underground water that springs are derived. In many places matters dissolved in the upper layers of soil are carried down a short depth and being redeposited, cause the formation of a hard layer known as hard-pan, which the roots of plants do not penetrate at all or only with difficulty. Where the soil lies horizontally this hard-pan may form vast underground sheets, such as those known in the Landes of south-western France as *alias*, in the plains of northern Germany as *ortsteine*.

Surface temperatures penetrate only to a slight depth. Daily variations in temperature cease to be observable at a depth of about three feet, and even the yearly variations are perceptible at most to a depth of 80 to 100 feet. The depth at which they can be detected is least in the tropics, about twenty feet, where the annual range of the surface temperatures is least, and greatest in the interior of the continents, where the corresponding range is widest. Below the level of this layer of constant temperature the temperature underground steadily increases at a rate that varies somewhat with different circumstances, among which the conductivity of the rocks is prominent, but is calculated to be on the average about 1° F. for every 60 feet depth. This is the cause of the variation in the temperature of spring water, that coming from the greatest depth having the highest temperature, and generally, therefore, the greatest abundance and variety of mineral content. Most medicinal springs are hot springs. The result of the small depth of the layer of constant temperature in the tropics is that spring water there is never refreshingly cool but always at temperatures of from 68° to 72° F.

On the other hand, in Iceland, where there are low equable temperatures and there is consequently a layer of constant temperature near the freezing-point close to the surface, the spring waters are so cold that instead of being allowed to irrigate the fields they have to be carefully led away from them, as their effect would be disastrous. The increase of temperature with depth below the surface has a great effect in mining operations and in tunnelling under high mountains. Men cannot work for any considerable time in dry air when the temperature is above 120° F., or in moist air when it is above 105° F., or even less. Now at Edinburgh a temperature of 105° might be expected at a depth of less than 3,500 feet, one of 120° at about 4,350 feet. This latter depth is one that is commonly attained by many mine workings, and there are mines over 7,600 feet in depth in South Africa, but it is only by the most careful ventilation that the working of such mines is practicable and a high mortality prevented. In the moist air of the Alpine tunnels great difficulty was met with in carrying on the work even at temperatures of 90° F., and the piercing of the Simplon tunnel would have been impracticable but for the cooling due to the expansion of the compressed air which was used to drive the boring tools.

II. THE SOIL AND ITS TREATMENT

The soil exercises an influence on vegetation in various ways. In the first place, it supplies a portion of the food of plants. It supplies also substances which may not be themselves converted to any great extent into vegetable tissue, but which serve to carry about the food-stuffs from one part of the plant to another, or to effect the necessary changes in these food-stuffs, from whatever source they may be derived. And, thirdly, the nature of the soil affects the life of the plant by the effect it has upon the temperature of the roots, or other parts of the plant embedded in the ground; for some soils are more readily heated than others, and more readily give up their heat to bodies in contact with them.

Soils differ from one another in two classes of characters, physical and chemical, both of which are of importance to the vegetation belonging to them. Physically, soils differ from one another in the condition of their particles. They may be coarse or fine, porous or compact and tenacious. Other things being equal, the fine—loam or silt—soils are more fertile—that is, supply food more plentifully to the vegetation living upon them—than the coarse; for all the food which plants derive from the soil enters the small rootlets dissolved in moisture, and the finer the earthy particles the more easily are the necessary substances dissolved. This is one reason why the soil of deltas is almost invariably remarkable for its fertility,

for such soils are made up of the finer sediment carried along by a river. When, however, the mineral particles become so small as to be ultramicroscopic (i.e. clays) the soils take on quite a different character and become tenacious and non-porous.

The advantages or disadvantages of porous soils as compared with those which are compact and tenacious vary according to circumstances. One advantage porous soils nearly always have—that of being light and easily worked by the plough or spade. They are also easily permeated by water, and thus readily permit rain to sink into them, instead of running in great part off the surface, and at the same time favour the rise of moisture from great depths, by the action of capillarity (the action by which liquid diffuses itself through a lump of sugar). But this may be an advantage for certain plants or in certain climates, and a disadvantage for other plants and in other climates. It is a disadvantage to plants that require the retention of a great deal of moisture about their roots; and while it may be, and generally is, an advantage in climates in which showers are frequent and the atmosphere moist during the growing season, it is a disadvantage in climates of an opposite character, where it is of importance for the plant life that the moisture in the soil should be long retained within reach of the roots—that is, that it should neither sink away to a great depth, nor rise up too rapidly and quickly evaporate, thus giving the plants the benefit of the moisture for only a short time.

In moist climates porous soils are generally, in virtue of the superior dryness of their superficial layers, more easily warmed than heavy and compact soils, and that not only because water requires a greater amount of heat to raise its temperature to a certain degree than any solid substance, but because of the loss of heat by evaporation. Hence light porous soils are generally described as dry and warm, and those of the opposite kind, like clays, as wet and cold. Soils may be so compact as to prevent the access of air to the roots and hence infertile from that cause.

So great are the natural differences in respect of chemical composition that, to take wheat as an illustration, the soil of one region may yield a crop of 50 or even 70 bushels to the acre, whereas that of another yields, with a climate equally favourable, no more than 12 or 15 bushels, or perhaps even less. The composition of the soil often varies very greatly from local causes within limited areas; but there are, on the other hand, many wide regions noted for being covered with a soil either characteristically rich or characteristically poor. Everywhere, it ought to be mentioned, the soil is due to the crumbling away of solid rock under atmospheric weathering (which varies according to the climate) more or less modified by the vegetable, and even the animal, life that comes to occupy it. Large deltas are generally remarkable for their fertility, not only, as above

indicated, in consequence of their physical nature, but also because they contain ingredients derived from the whole basin of the river by which they are formed, and hence are likely to contain all the constituents which a variety of plants require as food. For a similar reason, great alluvial plains like those of the Ganges and the Po are generally remarkable for their fertility, and so also are the beds of former lakes, such as the basin of the Red River of the North, in the United States and Canada.

Organic matter, or humus, the product of decay of vegetable matter, mixed with earthy (mineral) constituents, renders a soil of great fertility, rich in plant food. A wet soil, however, hinders the intermixture of the vegetable remains with the earthy particles and causes the formation of what is called acid humus, of which peaty soils are the most familiar example. The moisture of such soils is not readily taken in by the plant tissues, and hence those soils are adapted only to a special kind of vegetation of a dry woody habit like heaths. In some places humus is formed very abundantly in tropical forests, where vegetation is continuous and the accumulation of vegetable waste proportionately rapid. But it is not readily formed in all tropical forests. If the climate has long dry spells and the forests are rather open, the falling leaves dry up, get hard and crisp, and are easily broken by the wind, so that their elements are dispersed in the form of gases. To this cause is ascribed, in a great measure, the infertility of a large part of Brazil. Where there is a regular winter accumulation of snow, this covering has, among other important effects, that of burying the fallen vegetable matter and saturating it with moisture so as to favour the formation of vegetable mould. The action of earthworms in promoting the formation of a soil rich in this ingredient, by covering the surface deposits with layers of earth brought up from beneath, has been made a matter of almost universal knowledge by the well-known work of Darwin.¹

Many lavas or rocks originally poured out from the interior of the earth in a liquid state decompose into a soil of exceeding richness. Soils of this kind form some of the most fertile tracts, not only in Java and Japan, Campania and eastern Sicily, and other

¹ It is singular that the anticipation of Darwin's observation in a book so popular as Gilbert White's *Natural History of Selborne* should, apparently, be so little known, and that Darwin himself should have forgotten White's remark. The passage referred to occurs in Let. LXXVII (edn. of Capt. T. Brown, 1833; Let. XXXV in the edn. of E. T. Bennett, revised by J. E. Harting, 1875), where we read:—'Earthworms, though in appearance a small and despicable link in the chain of Nature, yet, if lost, would make a lamentable chasm. For . . . worms seem to be the great promoters of vegetation . . . by boring, perforating, and loosening the soil, and rendering it pervious to rains and the fibres of plants, by drawing straws and stalks of leaves into it; and, most of all, by throwing up such infinite numbers of lumps of earth, called worm-casts, which, being their excrement, is a fine manure for grain and grass.'

regions where there are volcanoes still active, but in many regions where there have been no volcanoes within historic times. Among the latter are soils covering considerable areas in Hungary, and the much more extensive tract which forms a large part of the wheat-growing area of Oregon and Washington in the United States, the tract occupying both sides of the Columbia River, where the soil results from the decomposition of a broad basaltic plateau; also the coffee soils of Sao Paulo in southern Brazil, due to the disintegration of diabase rocks rich in potash and other fertilising ingredients. In some cases, so rapid is the decomposition of lava, that some of the vineyards on the slopes of Mount Vesuvius occupy lava fields which came into existence within the nineteenth century.

Among other soils noted for their fertility occupying extensive areas in different parts of the world may be mentioned the black soil (chernozem or black-earth) of southern Russia and central Asia, the yellow loessic soil of northern China, and the black cotton-soil of the Indian plateau, which last differs from all the others previously mentioned in being very stiff and heavy, and owes a large part of its fertility to its being so peculiarly suited to the character of the climate where it is found, in that it is very retentive of moisture.

The soils known as laterites, from being of a colour and having a porous nature like red bricks (Lat. *later*, a brick), are characteristic of tropical and sub-tropical climates, being due to the rapid decomposition of the rocks under the influence of rapid changes in temperature, and the alternation of wet and dry seasons. They owe their red colour to the presence of iron, and when fully formed iron and alumina remain as the chief constituents. The lime, potash, and magnesia which may have been contained in the rocks from which they are formed all disappear, and in the high temperatures of the tropics even the silica gets dissolved and washed away, frequently being redeposited as a cementing substance in underlying sands. When the process is thus carried out to its full extent such soils are almost worthless, but this takes place only in exposed situations where the rainfall is very high, though the term laterite is freely applied to many red earths in which the solvent action has not gone so far, and which, accordingly, vary in their properties, some being fertile, others not. If the term is applied generally to the red earths of the tropics, then laterites have been estimated to cover 49 per cent. of the area of Africa, 43 per cent. of that of South America, and 18 per cent. of that of Asia. But this estimate includes under the head of laterites the red soil which is found to be particularly favourable to the coffee-tree on the slopes of the mountains of eastern Brazil, south of Rio de Janeiro. In many parts of Africa the infertility which characterises this soil is due rather to its physical than its chemical characters. The solution of the silica has proceeded only so far as to coat the particles

of earth with a thin glaze, giving rise to a soil so porous that the rain runs through it very readily, and as such soil is found in that continent over wide areas to a great depth, in those parts the soil dries up with remarkable rapidity, unless refreshed with frequent showers.

The soil of arid regions is in many cases chemically very rich, so that when water is supplied the ground is exceptionally productive. For this there are two reasons. The soil is largely wind-borne, and being collected from wide areas is likely, as in the case of the soils of river deltas, to possess a great variety of ingredients. Second, such vegetation as does grow naturally in those regions produces an exceptional growth of underground parts, and those parts of a plant are always richest in nitrogen. Hence, though the soil may be comparatively poor in humus because of the scantiness of the vegetation, its nitrogen content is not correspondingly feeble, and may be considerably in excess of that found in humid areas.

In the arid or drier parts of the earth the soil is frequently highly infertile, and even poisonous to vegetation, from the excess of salts found on the surface, due to the fact that the moisture which does penetrate beneath the ground dissolves the salts in the earth, and then, rising up again and evaporating, leaves the salts as an incrustation behind. Vast areas of this description are found in the interior of Asia and south-eastern Europe, of Australia and South America, while smaller tracts of the same nature exist here and there as patches amongst the fertile regions of California and the Canadian Prairies, where they are known as 'alkali spots.' The formation of such salt incrustations is one of the risks attending irrigation.

It will be clear from the above account that soils depend very largely on climatic conditions; indeed, the great soil groups of the world correspond largely with the great climatic regions. This generalisation was first generally appreciated in Russia by Glinka and the many soil scientists or pedologists who followed him. Within a major soil group local variations may depend largely or mainly on the characters of the underlying rocks. This is notably the case in a cool, moist climate such as Britain where many of the soils are 'acclimatic.' Soil science has made much progress in recent years and one method of study widely followed is that of the 'soil profile.' Many soils, traced from the surface downwards, exhibit a surface horizon of 'leaching' (the A horizon), a lower horizon of secondary enrichment (the B horizon), and a lowest horizon of slightly altered parent rock (the C horizon). These three horizons are particularly well seen in the ash-grey soils or podsoils of northern latitudes—soils of the northern coniferous forests, often lacking in fertility owing to the extensive leaching from the surface layers.

Preservation of the Properties of the Soil.—However rich a soil may be by nature, sooner or later its fertility will be impaired by cultivation unless means are taken to prevent this deterioration.

The substances that serve as the food of one crop are removed when that crop is carried away and consumed elsewhere, and as the same kind of plant always requires the same kind of food, the fertility of a soil is in general reduced very rapidly when the same crop is grown repeatedly on the same land, and when nothing is done to restore the ingredients that are thus removed. Under a careful system of cultivation two plans are adopted to counteract this tendency of the soil to lose its fertility. One is to vary the crops that are cultivated in succession on the same piece of ground, which spares the land in two ways. First, since different plants withdraw from the soil different substances as food, or at least varying proportions of the same substances, a crop requiring chiefly one kind of food is made to follow a crop which requires chiefly another kind. Secondly, it is not always necessary to remove from the ground the whole of the cultivated plant, and the parts of the plant not required may be returned to the ground, and help to restore to it some of the ingredients required not only by this crop but by crops of other kinds.

Obviously, however, this method is an imperfect one, and the only way to maintain permanently the fertility of the soil is to restore by fertilisers the ingredients that are withdrawn by successive crops. But here it must be noted that the quantity of matter that has thus to be returned to the ground is small in comparison with that which is carried away as produce of the soil, even though the plant-food contained in the manure is generally a small proportion of the bulk of the manure itself. It has been found by experiments made in England in the cultivation of wheat that the use of 200 lb. of a particular kind of manure made a difference of nearly 600 lb. in the weight of grain yielded by an acre of land, as compared with a piece of land, of the same extent and the same natural qualities of soil, that had borne wheat without manure nine times in succession; and this difference, it will be observed, does not take into account the weight of straw and other parts of the crop. The reason of this is, that though all plants derive some of their nourishment from the soil, and the amount of their produce is generally more or less governed by the amount of nourishment obtainable from that source, yet in all cases the chief constituents of plant-food are derived from either air or water.

Small as the total proportion of plant-food derived from the soil is, the constituents of such food are very varied; but the three essentials to plant-growth most likely to be lacking in cultivated soils are nitrogen, phosphoric acid, and potash, and hence manures containing these substances are most important as articles of commerce. All three are contained in animal excrements and in animal refuse of various kinds, and these, accordingly, are generally the most convenient manures to apply to the ground where mixed farming

(part crop-growing and part cattle-feeding) is carried on. It had long been known that leguminous crops such as clover, lucerne, beans, peas, and lentils not merely required no nitrogenous manures but even served to replenish the soil with soluble nitrogen for subsequent crops, but an important stimulus to the cultivation of such crops for use as green manure was given by the discovery in the eighties of last century that this was due to the fact that bacteria present in nodules on their roots and rootlets served as the means of fixing nitrogen derived from the air. The name of commercial fertilisers is given to various compounds, nitrates, phosphates, and potassic salts, or mixtures of these, artificially prepared, containing the above-mentioned ingredients along with others, as well as to natural compounds which are found in deposits of greater or less abundance in various parts of the earth, and are worked as minerals, though they may be to a large extent of vegetable or animal origin. These enter into world trade to the amount of millions of tons annually; in 1951-52 the world's demand for nitrogen compounds was just over 4½m. tons. This is exclusive of the still larger quantities, at least of nitrogen and phosphorous compounds, that become available as animal excrements after first being employed as feeding stuffs.

Of the artificial fertilisers, the bones of animals variously treated have long been used. Being to a large extent composed of phosphate of lime, they are of great value as manure, not only on account of the phosphoric acid which they contain, but also on account of the nitrogen always present, and also because of the lime itself; for though this last substance is not so important as phosphoric acid as a plant-food, it is often of the highest importance as a manure from the fact that, by bringing about certain chemical changes, it helps to make the constituents of plant-food which are present in the soil available to the vegetation. For, seeing that, as already stated, all the elements which a plant derives from the soil enter the rootlets in a state of solution, no constituent of plant-food is of any use to the plant unless it be first dissolved; and among other uses which lime has as a fertiliser one of the most important is this: that it is one of the best materials that can be employed for neutralising the acidity of the soil and rendering available substances which the plant would otherwise be unable to withdraw from the soil. For use as manure, bones are in some cases merely ground into a coarse meal, in other cases steamed so as to remove most of the nitrogen but to leave a high proportion of phosphorus, and in yet other cases treated for the same purpose with sulphuric acid so as to produce what are known commercially as superphosphates, although in this branch of manufacture mineral phosphates are mainly used. Since 1886 a fine meal or flour obtained by grinding basic slag, which contains from 30 to 35 per cent. of phos-

phate of lime, has become more and more used as a phosphatic manure. For many years there was an enormous trade in the export of Chilean nitrate (sodium nitrate) from the desert regions of northern Chile. The mineral phosphate (guano) derived from the droppings of birds is a product of many tropical islands and mineral phosphates are mined elsewhere. All these mineral fertilisers have severe competitors in the artificial fertilisers produced by the factory. Thus sulphate of ammonia forms a valuable nitrogenous manure, and since the early part of the present century various nitrogen compounds have been made from the air for the same purpose, mainly with the help of the intense heat of the electric furnace.

Notwithstanding the manifest advantages of the adequate use of manure in maintaining the value of the soil, its employment in sufficient quantity to ensure the preservation of a high degree of fertility is far from being general. Manure is, as a rule, but little used, first, where the population is sparse, and, secondly, where the population is poor. Where the population is sparse land is cheap, and the cultivator may find, and usually does find, it more profitable, at least at first, to derive as large crops as he can from the ground without manure, and begin to cultivate new ground when the first shows signs of being exhausted. Moreover, where the population is scanty, there are for obvious reasons fewer opportunities of obtaining animal manure, which in regions possessing a dense population is the kind most readily available. In the United States, the use of manure has gradually spread westwards, following in the wake of cultivation. The eastern states, which were those first cultivated, were in the beginning cultivated without manure, and as these lands became partly exhausted, others farther west became the chief regions of agricultural production; but at the same time, as the population from the development of commerce and industry thickened in the eastern states, the use of manure to restore fertility to the fields of that region became more and more general.

Cultivation on this system, involving the use of a greater and greater extent of land, is known as extensive cultivation, as opposed to intensive cultivation, which consists in putting more into the land to get more out of it; and the furtherance of the latter system—that is, the increasing use of manure—is always a sign of advancing agriculture and industry in general. The great productiveness of wheat in the countries of western Europe is due to the practice of this system.

In India, though the population is dense, manure is still little used; but the principal reason of this is that the employment of manure, besides always involving a certain amount of expense, does not yield its full benefit in the way of increased produce in one or two crops. However desirable it may be to maintain the

fertility of the land, costly manures cannot be used where the cultivators are too poor, as most of those in India are, to be able to wait and look forward to future years for the reward of an outlay on their farms. Owing to the poverty of the peasant farmers and the scarcity of firewood the cow dung which should be returned to the land is made into cakes and burnt. Thus the Indian farmers are obliged to content themselves with the small returns of unmanured ground.

Reference has already been made incidentally to the loss of soil where the crops are grown on hill slopes. But such loss is apt to occur wherever there is sloping ground, and especially where the crop does not cover the soils completely. Where grasses, including the ordinary European cereals, are grown the loss from this cause is not rapid, and may be made good by the natural formation of new soil; but it is otherwise with such crops as maize, tobacco, &c., which have considerable intervals between the individual plants. All the more serious is this loss if the climate is arid and the soil loose and powdery. In recent years this soil erosion has become one of the greatest problems of the United States. Great tracts of once fertile land have been robbed of their soil by dust storms; the rapid run off of rainwater unhindered by vegetation has, at the same time, resulted in disastrous floods. The Soil Erosion Service of the Federal Government is experimenting with preventive measures such as forming with the plough long mounds, known as magnum terraces, at right angles to the direction of slope so as to arrest the flow of soil-bearing water. The most effective preventive seems to be the grassing of exposed slopes. In Africa also soil erosion has become a very serious problem. In general, in all parts of the world, the tendency is for the higher parts of ground to become impoverished by erosion. The lower parts are correspondingly enriched where there is no tendency to an excess of moisture. The most productive parts of sloping ground are for the most part those just above the lowest level—one reason for the prevalence of agricultural villages at the base of hills.

Irrigation.—As manure is the means of correcting deficiencies in the soil, whether these be original or the result of exhaustion, so irrigation is the means of remedying one of the great defects of climate in many regions, the deficiency of rain. The ease with which this remedy can be applied varies greatly according to circumstances. Nowhere is it easier than on the land adjoining those rivers which regularly overflow their banks, like the Nile, the Tigris, and Euphrates or, in past times, the Ganges. In such cases, all that is necessary is to provide canals and sluices by means of which the flow of water over the surface of the land may be to some extent regulated; and it is likewise a fact of the highest importance that the irrigation of land so situated is not only exceptionally easy, but also of excep-

tional value. For a river when highest in flood is always most highly charged with fertilising sediment; and so rich is this in the valley of the Nile, for example, that wherever 'red water' can be supplied there is no need for manure. Formerly in the Ganges valley, again, embankments were in few places required to restrain its inundations, for the alluvial silt which it spilled over its banks year by year afforded to the fields a top-dressing of inexhaustible fertility. If one crop were drowned by the flood, the cultivator calculated that his second crop would abundantly requite him. But the most urgent need of water is in those dry seasons when the river floods are deficient, and the policy in India for many years has been the replacement of inundation canals by perennial canals. There are now scarcely any of the old type left. The usual system now, in India as elsewhere, is to build a dam across the river, often in an upper part of its course, and then to lead canals from the artificial lake so created. Branch canals lead from these, and then distributaries, all controlled, conduct the water to the fields. Spare water seeps back gradually into the river course.

In other cases, various more or less costly methods have to be employed to render water available. Water may be raised by buckets from wells or rivers. Large tanks (these may be of concrete, as on the banana plantations of the Canary Islands, and should not be confused with the so-called tanks of India which are small lakes made by damming a stream) may be constructed to store the superfluous waters of one season or period against the deficiencies of another.

In some places the structure of the country is such that when holes are dug in the ground to a certain depth water rises freely to the surface often with great force. Wells so made are called **artesian wells**. Such wells have been sunk in many regions where the rainfall is deficient. Large areas, as of Australia, formerly wholly or nearly barren, have been made more highly productive. Usually, however, artesian water is too highly charged with mineral salts to be suitable for irrigation, but it is excellent for watering stock.

Irrigation water can be much more profitably used in agriculture than an equal quantity of rain. It can be preserved in tanks till the exact period at which it is needed. It is thus kept from sinking into the ground to a great depth, and so becoming lost to vegetation, as happens to much of the rain that falls upon the earth where the soil is highly porous. At the same time it suffers infinitely less loss than generally diffused moisture through evaporation—a matter of peculiar importance in those bright and warm regions where irrigation is specially required. For crops of great value it is even sometimes found of advantage to distribute the water to the fields entirely by underground pipes. By the adoption of this method evaporation is almost wholly prevented. It is often difficult to teach the peasant

cultivator in arid regions that too much moisture can be injurious to his crops: there is actually an optimum quantity which if exceeded results not only in waste of precious water but also in a decrease in production.

It will be seen that though irrigation is almost always costly, the advantages derived from it are correspondingly great. They are chiefly: (1) The supply of water by irrigation is more certain and regular than that by rain even in regions where the rainfall is generally plentiful, and that of itself increases crop production. (2) Irrigation water is often more or less rich in fertilising ingredients; in India, as a general rule, irrigation doubles the weight of crops off the same land. (3) Irrigation by flooding is sometimes of service in washing away noxious constituents from the soil. (4) Irrigation often enables valuable crops to be grown in place of inferior ones. (5) It renders cultivation possible in some cases during the whole period of the year for which the temperature is sufficient. In southern California, as well as in western Arizona, crops may be started at whatever season suits the convenience of the grower, except two months in the year, and this holds true for market-gardens as far north as San Francisco; in some areas five cuts of alfalfa may be taken off the same field in a single season. In Algeria three crops of potatoes may be grown in succession in one season on irrigated land. It naturally follows that the density of population in irrigated regions often reaches a very high point. In the irrigated portion of the Spanish province of Murcia, for example, the density is nearly 1,700 to the square mile, as compared with 136 per square mile for the average of Spain generally.

It is one of the chief advantages of terrace cultivation—that is, the cutting of hill slopes into terraced fields rising step-like above one another—that fields so made are irrigated with great facility. Hence this mode of laying out fields is largely practised in the warmer parts of the world, and in some cases a marvellous amount of labour is spent on them. Describing the ascent from Hodeida to Sana in Yemen, Major-General Haig wrote: 'The whole mountain side, for a height of 6,000 feet, was terraced from top to bottom. The crops had all been removed; only some lines of coffee trees here and there were to be seen, but everywhere above, below, and all around, these endless flights of terrace walls met the eye. One can hardly conceive the enormous amount of labour, toil, and perseverance which these represent. The terrace walls are usually from five to eight feet in height, but towards the top of the mountain they are much higher, being sometimes as much as fifteen and eighteen feet. They are built entirely of rough stone laid without mortar. I reckoned on an average that each wall retains a terrace not more than twice its own height in width. So steep, in fact, is the mountain, that the zigzag continues almost the whole way to the top.' Typical of many

parts of monsoon lands in Ceylon, Java, China, and Japan are the irrigated terraces for rice cultivation.

The extension of irrigation works in many of the drier parts of the world—Egypt, Iraq, India, Turkestan, the United States, Canada, Australia, and South Africa—has been a special feature of modern development. But irrigation after all is confined to limited areas, and many arid or semi-arid areas must rely on what is called **dry farming**. By this is meant the treating of the land in such a way as to conserve the moisture it contains, the essential thing being to prepare the surface in the form of a mulch. This term is applied to any covering of the surface that tends to resist the action of capillarity and protect the moist earth underneath against the direct rays of the sun. Even stones spread thickly over the ground may serve as a mulch, and in the drier parts of the Mediterranean region stony tracts are regularly sown which in a moist, cool climate like that of the British Isles no one would think of cultivating. In gardening operations mulches are made with leaves, manure, straw, and similar materials, which, though very effective as mulches, have the drawback of preventing the continual stirring of the land and consequently the aeration of the ground underneath. But this continual stirring itself provides an excellent mulch in the form of a dry powdery surface soil, and it is by the frequent use of the plough, harrow, and other implements of tillage that dry farming is generally carried on. In loose light soils this treatment is supplemented by the use of an implement known as the sub-surface packer to consolidate the earth underneath the surface and so retard capillary action. Dry farming has long been practised in the drier parts of India, southern Russia, and elsewhere; in particular it is widely followed in the arid regions of the United States, Canada, and Australia. The folly of attempting to farm in some of these arid tracts has been freely demonstrated, and the general tendency has been for the ‘pioneer fringe’ to move back; but the value of dry farming methods is fully appreciated in all regions near the economic margin for farming, notably in South Africa, though the danger of wind storms and of sudden rain storms in promoting soil erosion will be apparent.

III. LABOUR AND ITS EFFICIENCY IN THE LOCAL PRODUCTION OF COMMODITIES, AND NATURAL FACTORS AFFECTING LABOUR SUPPLY

Labour.—The influence on production of what is usually designated labour varies with the quantity required and the quality available to furnish a given amount of product. In such industries as coal-mining the quantity required to produce a certain value is high, about two-thirds or more of the total cost. In the case of

coal in Britain it has been variously estimated at between 64 and 80 per cent. of pithead cost and this throws much light on the relation between wages and price of coal. The National Coal Board after the Second World War in Britain gave a figure of about two-thirds. Before the First World War the average cost of labour in finished articles of engineering was estimated at 45 per cent. of the total, in textile products at only 15 per cent. The quality of human labour cannot always be measured. Where it is measurable, it is by the amount of product per head turned out in a given time, whether without the aid of machinery or in association with machinery of the same type; and it is obvious that a high production per head in any region or industry is what renders possible a large surplus of time or labour for employment in other industries or for leisure, which latter use may be itself contributory to a high rate of production in working hours.

Human labour may be broadly divided into slave, or forced, and free labour, the latter being that which is now generally employed in the production of commercial commodities. There are, however, great diversities in the condition even of free labourers in different parts of the world. One of the most obvious is that of money wages. The highest wages are those paid in 'new' countries such as the United States and Canada, Australia, Uruguay, and the Argentine Republic; the lowest are paid in tropical countries, and in particular in those regions in which there is an exceedingly dense population dependent mainly on agriculture.¹ Wages should never, however, be considered apart from the cost of living.

The highest-paid labour is as a rule also the most efficient, that is, able to produce a greater result within a given time. In an official report published in 1919 [Cmd. 442] on the relative efficiency of Lancashire and Indian operatives in the cotton industry it was stated that the ratio of efficiency was as $2\frac{1}{2}$ to 1. In Cawnpore nine men were still required to work a mule of 800 spindles where, it was said, only three would be necessary in a Lancashire mill. A Lancashire weaver at that time minded four looms by himself, whereas in India 50 per cent. of the weavers would only mind one loom. The limit is now placed not so much by the powers of the operatives as by regulations made either by government or by their own trade unions to prevent their exploitation.

The reason of the difference of efficiency is to be found in various causes. Much is undoubtedly due to difference of race and climate, but much also to difference in food and dwellings and to difference

¹ Thus in Oudh, one of the most densely peopled territories in India, the average monthly wage for an able-bodied agricultural labourer in 1901-3 was 3.0 to 3.7 rupees, or about 4s. to 4s. 11d.; in 1916 about 12 rupees. In Burma, the most sparsely peopled province in proportion to its resources, it was 14.1 to 15.1 rupees, or about 18s. 9d. to 20s. 1d. (*Imp. Gaz. India*, new ed., iii, p. 472). In Burma the rate had increased to about 30 rupees in 1926.

in intelligence, the highest-paid labourers being those who can afford to live in the best houses and eat the most nourishing food. This last consideration has led increasingly to sound social legislation, involving large expenditure, which, however, is probably remunerative. Seeing that all the countries of the world now work more or less for one another, the people of the world generally would benefit by the world-wide spread of such legislation. In other words, what is sometimes considered the unfair advantage accruing to Japan through low labour costs would disappear with an increased standard of living there. (Cf. reference Calcutta jute mills, p. 14.)

But the condition of the labourer also is very inadequately indicated by the difference in the rate of wages, since the wants of the labourer are very greatly affected by different circumstances, and above all by climate. In a region where the winters are severe, the labourer has to spend more in providing himself with adequate protection against the weather by means of good housing, clothing, and fuel than he has to do in a region where the climate is less severe, without being better off in health and comfort than a labourer in the more favoured region. The food required in a temperate climate, and especially one of the colder temperate countries, moreover, is of a much more expensive kind than that suitable to a tropical or warm temperate climate. Even in Japan, which lies in the same latitude as the east of the Mediterranean, and has a much severer climate, the farm labourers live almost entirely on rice, barley, or wheat, beans, peas, and other vegetable food; in summer they wear little more than a cotton garment or two, with straw sandals and wooden clogs for footwear. It is worthy of being pointed out, however, that those parts of the world in which the highest wages are paid are also those in which many of the most important necessities of life are cheap. Cheap land ensures relatively cheap food, which may more than make up for the dearth of manufactured articles to the working-man; and the advantage of high wages is still further increased if the climate is mild, as in Australia.

Even free labour is subject to many restrictions imposed by custom and religion, by government interference, or by the voluntary organisations of the labourers. In all Christian countries custom and religion have established the Sunday as a day of rest; and though this abstention from ordinary labours on Sunday is probably nowhere rigorously adhered to, it is more generally observed in the British Isles and the countries of British origin than elsewhere. In Roman Catholic countries, and the countries belonging to the Greek Church, the days devoted to religious festivals take a more prominent place in interrupting the ordinary course of labour than they do in Protestant countries. In Mohammedan countries Friday (even in pre-Mohammedan times a day of rest in Arabia) is specially

devoted to religious services, but it is less rigorously observed as a day of rest than the Sunday in Christian lands.

The interference of government with the employment of labour in free countries is in some cases in the form of enactments limiting the number of hours of work to be exacted in a day; in other cases in other modes. The Factory Acts in the United Kingdom professedly limited the working hours in factories only for women and children. The provisions in those Acts that expressly applied to adult male workers were only such as were intended to secure health and safety. Since the First World War, however, there has been a general limitation of the number of hours' work for men. The employment of the young is now limited in Great Britain under the Education Acts, culminating in the Act of 1944 which provided for raising the school-leaving age in 1947 to 15 (later 16) and for at least part-time education to 16 (later 18). The Employers' Liability Act of 1897 rendered employers liable in certain cases for injuries sustained by persons in their employment, whether there may have been any contributory negligence on the part of the injured or not. This was developed until in 1946 compensation for industrial accidents became a contributory social service extending to all persons employed under contract, without limit of income. There is similar legislation in many European countries. In Switzerland the limitation of hours expressly applied to men as well as women and in Germany the Imperial Industrial Code empowered the Imperial government to limit the hours for men and women alike where excessive hours were deemed injurious to health. The former German Empire was the pioneer in the insurance of workmen against illness (under an Act of 1883), against accidents (1884), and in providing for old-age pensions, beginning at the age of seventy (1889). In the United Kingdom old-age pensions, beginning at the same age, were introduced in 1908, and later measures led to the National Insurance Act of 1946 which consolidated existing schemes of insurance against sickness, unemployment, and old age. Such insurance was made compulsory and universal. Relief for the married worker was provided in 1945 by family allowances in the form of a weekly grant for each child after the first, in addition to free milk and subsidised meals at school. In the United States labour legislation has been a matter reserved to the individual states, and in such legislation Massachusetts was often the leader. Under the Roosevelt administration of 1933-45 the Federal government formulated a series of 'codes' for the major industries.

Trade unions and similar voluntary organisations among labourers impose various restrictions on the labour of their members for the sake of what is believed to be the general interest of the body, the efforts of these organisations being directed mainly to the obtain-

ing of as high wages and as short working hours as are possible in any given state of trade and industry. Such organisations are most highly developed in countries, like the United Kingdom, in which manufacturing industry is most highly advanced; but unions having similar objects have existed at all times in many countries. Among the labourers of China trade guilds exercised important functions of various kinds. Chinese emigrants have carried the system with them into the lands to which they emigrated. In India the caste system as now developed acts to some extent in the same way. As a trade union each caste 'insists on the proper training of the youth of its craft, regulates the wages of its members, deals with trade delinquents, and promotes good fellowship by social gatherings'. (Hunter's *Gazetteer*, 2nd ed., vi, 197.)

The kind of labour known as **coolie labour** is a form of free labour, but a peculiar one. The term has been applied particularly to emigrants from India and China who bind themselves to work for a term of years (generally five) on plantations in European tropical and sub-tropical colonies. They are entitled to regular wages while their term lasts, and in some cases to a free passage back to their own country when their term has expired. Contracts for the engagement of coolies in India and China are allowed only under certain regulations, and it was sometimes found necessary, owing to the treatment to which the coolies were subjected, for the government of the country from which they were derived to prohibit such engagements with certain countries altogether. Of recent years indentured labour of this type has become less common.

Somewhat similar contracts are made even with bodies of European labourers, the chief difference being that in their case the work on which they are engaged is generally the execution of some great public undertaking. They were very largely employed in the United States on the construction of railways until an Act of Congress in February 1885 made the importation and migration of foreigners and aliens under contract illegal. In new countries at an early stage immigrants are generally welcomed, for labour is urgently needed, but a time comes when there is a tendency to restrict immigration, as in the United States and parts of the British Commonwealth, though the Second World War gave renewed impetus, temporarily at any rate, to immigration schemes in the Commonwealth. A tendency to make arrangements for land settlement by families of particular nationalities found expression also, before the war, in the migration of Italian and German families to the South American states.

Slave labour of the old-fashioned kind is now virtually extinct. At one time or another slavery has been practised in all countries, and even in Europe down to the nineteenth century. It was only in the latter part of that century that the system was ended in the

tropical colonies of European countries, Great Britain having set the example in 1833 by passing an Act for the emancipation of the slaves in countries under British rule. So far as the production of commercial commodities was concerned, the immediate effect of the abolition of slavery was in many cases disastrous. The freed negroes (for people of African origin formed the bulk of the slaves affected) preferred, wherever plenty of land could be had, to live the life of the peasant subsistence farmer, instead of working for wages, however high, on plantations. The consequence was that in Jamaica, for example, the annual value of the exports fell from an average of nearly three millions sterling during the period 1832-36 to less than two millions in the period 1842-46. In densely peopled islands like Barbados, where the negroes when liberated were obliged to work in order to gain a living, the effect was not so bad. In other parts of America in which slavery has been abolished subsequently, the effects have varied similarly according to circumstances, being little marked in respect of the quantity of production, at least where there were facilities for replacing slave by free labour and especially by the labour of white men. In parts of Brazil, for instance, the change from slave to free labour was eagerly welcomed by the entire body of the inhabitants, inasmuch as the work was done 'better, quicker, and with more care' by free men than by slaves, so that the benefit of emancipation was at once realised.

There are other forms of forced labour besides that maintained by the system of slavery. The system of serfage, according to which individuals with separate rights and separate property were yet attached to particular estates, for the owners of which they were compelled to work, and were usually sold with the estates, subsisted in Russia till 1861; and forced labour for certain purposes was up till much later exacted by the Dutch government in the East Indies, and by the government of Egypt. In Latin America multitudes of the population are kept in virtual slavery by the system of peonage, by which the poorer people are encouraged to contract debts to their employers, and care is taken to prevent them from obtaining release from those debts. In India, one of the most difficult tasks of the administration is to protect the peasantry against similar abuses on the part of money-lenders.

In those countries where freedom of political views is restricted use is made of political prisoners to provide forced labour. This was long the case under the old Russian Empire and work carried out by exiles to Siberia was of this nature. Modern cases of the same sort are too well known to be mentioned specifically though it is often difficult to establish how extensively forced labour is used.

Machinery.—The nature of the change that has been made in the conditions of production in manufacturing industry through the

introduction of machinery is sufficiently illustrated on pp. 180-82, where some account of the influence of modern machinery in the cotton manufactures is given. Here it will be enough to call attention to the fact that the changes due to this cause have all come about within little more than a hundred and fifty years, and that this applies even to the most important agricultural implements made of iron, which, along with agricultural machinery properly so called, have during the same period effected a parallel revolution in the condition of agriculture. The cast-iron ploughshare is an invention little more than a hundred and fifty years old (it was patented in England by Messrs. Ransome of Ipswich in 1785); and it was after the beginning of the nineteenth century that the cast-iron plough came into general use in America. In the present century steam as the prevailing means of driving machinery has largely given place to electricity and to various forms of internal combustion engines. Before steam came into use wind-power (chiefly in level countries) and direct water-power (chiefly in mountainous and hilly regions) were largely employed. Water-power, now used indirectly as hydro-electric power, has again come to be of first-rate importance. Even solar heat has been used as a source of power where the sunshine is sufficiently constant. The vast amount of tidal-power that might conceivably be utilised has again and again engaged the thoughts of engineers, but so far little has been achieved in this direction. Locally this power is used for such purposes as the deepening of harbour entrances, as at Venice and elsewhere, but the difficulties in applying it to the driving of machinery have not been successfully overcome. Only in the most favourable conditions could it be made available for any considerable portion of the day, and there is the added difficulty that the power is supplied three-quarters of an hour later every day. A tidal mill was described as seen at work by Arthur Young in the Gironde in 1788, but it is a tribute to that keen observer's insight that he remarks that it is doubtful whether the power thus applied would prove as economical as that derived from steam by the newly improved steam-engine.

The utilisation of machinery in production is in some cases dependent more or less on physical conditions, in others on the supply and attitude of labour. The extensive employment of agricultural machinery is influenced very largely by the surface features, great level plains being obviously peculiarly favourable to its use. But even where the superficial configuration presents no great obstacles to its use the climate may prove a hindrance, soft wet soils being unsuitable or at least difficult for heavy machines. In coal-mining it is only the thicker and more continuous seams that are well adapted for coal-cutting machinery. This is one reason why, in the early years of the present century, the use of such

machinery increased much more rapidly in the United States than in the United Kingdom. In the States, the seams of bituminous coal worked are only such as can be worked easily, whereas in the United Kingdom, with its older industry, most of the seams very easily worked in the older mines have been worked out. It is in the newer, larger, and deeper collieries of this country that coal-cutting machinery has since been making up lost ground.¹ Where labour is very abundant and cheap the use of machinery may not be economic. Thus, in the countries of the Far East the proportion of machinery to the number of employees is very small, and it has on occasion been found economically advantageous to replace expensive machinery with low-priced hand machinery. This is still the case, it would seem, with mechanisation of African agriculture. The employment of machinery even where it would be economic is frequently retarded by the opposition of the workers to its introduction. In rapidly developing new countries or regions this hindrance is less marked, and that is another reason why coal-cutting and many other machines, even when invented in this and other old countries, have first been generally adopted in the United States. The attitude of the workers in old countries is at least intelligible. Their first thought with regard to machinery is apt to be that it is a means of displacing labour and so reducing its price; and though in the long run the effect of machinery may be to ease the burden of labour and increase the abundance of produce available for the labourer, its immediate effect is often to inflict hardship on some. If the workers cannot all share in the benefits of machinery from the first, it is natural that they should at least desire to have the incidental hardships of its introduction mitigated as far as possible. That gives importance to efforts which have been made towards such mitigation by large employers.

Particularly in the present century, the economic distribution of power has been greatly affected by the progress of invention, which has made sources of power commercially available that were not so before. In illustration of this one may refer to the very extensive use of oil, alcohol, and gas as sources of power. The use of oil has a geographical significance not merely in connection with the distribution of mineral oils and oil-shales, but also because of the ease of handling when the special requirements of its transport have been considered. The use of gas is important because it allows of inferior

¹ Percentage of coal cut by machinery:—

	1891	1900	1906	1913	1924	1938	1948
U.S.	5.3	24.9	34.7	50.7	69.5	87.5	90.7
U.K.	—	1.5	4.1	8.6	19.0	59.0	76.0

The percentage has since increased in both countries, but the figures are not strictly comparable, because of the different methods of mining and statistical analysis.

coals being employed for the production of fuel in this form, and the use of alcohol stimulates the production of potatoes as a cheap source of this spirit. But it has been chiefly with the aid of **electricity** that this kind of economy has been effected, and probably in no other direction has greater progress been made since the publication of the first edition of this work in 1889. Electricity is a means of transmitting and applying power developed either by fuel or gravity (moving water or air). When the great mechanical inventions were first introduced they were applied chiefly by means of water-power. Afterwards this gave place, except under the most favourable conditions, to the more reliable steam-power. The transmission of power originally derived from falling or rapidly flowing water by means of electricity has given value to many water-powers which were formerly useless. Power is transmitted economically distances of at least 300 miles. In certain industries electricity, most frequently developed from water-power, is already completely victorious over steam. These are the industries in which excessively high temperatures have to be produced, as in the smelting of aluminium ores, the manufacture of calcium carbide and the fixation of atmospheric nitrogen, or great resistances (including strong chemical affinities) have to be overcome, as in the grinding of wood to wood-pulp and the dissociation of elements in certain very refractory chemical compounds. In these cases immense water-powers are the sole means available for developing the electricity with the necessary economy.

But electricity is in some ways an advantage even where coal or other fuel is burnt in order to develop it. Though there is a loss of energy in converting the power latent in coal into the form of electricity and then converting electrical into mechanical energy, electrical power can be transmitted to a distance with less loss than steam-power. This leads to several economies. The coal can be used to develop electrical energy where it is cheapest. It can be used for that purpose in one great establishment on a large scale, instead of in many places on a small scale; and in the end each one who uses the power can take for his requirements just as much as he needs and when he needs it. It thus becomes possible, where a great installation has been set up providing power up to a certain maximum required only occasionally, to make a certain proportion below this maximum, the so-called off-peak electricity, available at a cheaper rate for industries capable of making use of it whenever supplies can be obtained. Such a system replaces numerous steam-engines, each of which required its own attendants and had to be kept ready for work even when there was no work for it to do. Electricity applies the power with great smoothness and steadiness, an advantage of great importance, for example, in the textile industries and in steel rolling mills in which it has become extensively

used. When used for locomotion its advantages are various. More rapid acceleration is possible with electric locomotives than with steam, and that is one great reason why it is becoming so largely used on railways with a dense traffic and numerous stoppages, inasmuch as it facilitates a more frequent service of trains. In the United Kingdom the use of electricity in industry was doubled during the First World War. Since then the increase in its use has been specially marked since the linking up of the whole country by the 'grid' system, whereby electricity generated economically on the coal-fields or at favourably located power stations, preferably waterside, can be readily transmitted to towns less fortunately situated.

Devastating Agents.—War, the great occasional disturber of production and commerce, has already been considered (p. 11); but there are disturbing agents with which one has to lay one's account as more or less normal though not regular in their action. These may be classed under two heads—physical destroying agents, the most important of which are directly or indirectly due to climatic conditions; and destructive forms of life, whether vegetable or animal.

Among the physical destroying agents we may mention first, **frost**, from which most tropical and sub-tropical plants, such as coffee (p. 197), tobacco (p. 187), cotton (p. 172), suffer greatly when they happen to be exposed to it.

In certain regions, and especially in those which have a climate at once warm and arid, **hail** is often much more destructive than we could expect from the character of the hailstones which usually fall in England. Reference is hardly needed to the destructiveness of **violent winds** at sea, but it may be noted that great devastation is sometimes wrought on land by the hurricanes of the North Atlantic, north of $10\frac{1}{2}^{\circ}$ N. off the West Indies and Florida; the typhoons of the South China Sea, principally between the south coast of China and Formosa; the cyclones of the Indian Ocean, and especially the Bay of Bengal, occasionally raging nearly as far south as 6° N.; and above all the tornadoes of North America, where such storms reach farthest north and farthest into the interior of the land. These violent storms occur mainly at the change of the monsoons—from April to June, and from September to November in the Indian Ocean; in spring and autumn elsewhere.

To certain crops, and especially those which depend greatly on the amount of blossom that comes to maturity, like fruit-trees, cotton, coffee, &c., great damage is often caused by unseasonable winds of less violence; but more destructive on a large scale than any of the agents yet named is **drought**. The regions liable to suffer most heavily from this cause are those which lie on the borderline between regions in which an abundant, or at least sufficient, rainfall can always be depended on, and those in which the rainfall

is too scanty to admit of settlement without irrigation, but in which the rainfall, though sufficient in most years, is apt from time to time to fail. In the densely peopled regions of India and China situated in such 'famine zones', the failure of rain has often caused the loss of millions of human lives. Perennial irrigation and the improvement of communications have mitigated but not removed the dangers. In the less populous regions in the interior of North and South America, and in Australia, the destruction caused in this way is confined to sheep and cattle and other kinds of live-stock. Despite the protection afforded by artesian wells and storage reservoirs, after the great drought of 1914 the number of sheep in Queensland dropped from 23.1m. in 1914 to 15.9m. in 1915.

Great destruction is sometimes wrought by **inundations** on the banks of great rivers like the Hwang-ho, Mississippi, and the Ganges, or even like the Danube and some of its more important tributaries; also on low-lying lands in the neighbourhood of the sea. Stupendous embankments have been constructed along the Ganges in Lower Bengal to guard against this danger, but these restrain without altogether preventing the excesses of the inundations; and the same may be said regarding the similar works that have been executed in the United States and the Hungarian plains, on the banks of the rivers above named. Among the more memorable excesses of the sea may be mentioned that by which the greater part of the land converted into the Zuider Zee (about 2,000 square miles; now largely reclaimed) was submerged in successive inundations in the twelfth to fourteenth centuries, and that by which an area of about 3,000 square miles at the head of the Bay of Bengal was overwhelmed and many thousands of people lost their lives, during a cyclone in November 1876.

Volcanic outbursts and earthquakes, though fortunately comparatively rare occurrences in their more awful forms, may also be mentioned as physical agents which occasionally produce widespread destruction. The Japanese earthquake of September 1923 resulted in the death of nearly 100,000 people, inclusive of those who perished in the fires which followed.

The **living destructive agents** are probably on the whole more injurious than any of the physical agents above mentioned, inasmuch as many of them are extremely persistent, being very difficult to extirpate, and renewing their attacks on particular crops or on various forms of vegetation, animals, and man year after year. The mere enumeration of such destroyers would fill a volume, and whole volumes have been devoted to accounts of individual pests. Here we can only allude to a few of the more important.

The **vegetable pests** consist mainly of minute **fungi** which affect various parts of a plant and indicate their presence by the discoloration they produce. Such are the fungi producing the diseases

known as rust in cereals and mildew on the vine and many other plants, each subject to attack by its own fungus. Another is the fungus (*Hemileia vastatrix*) which has almost completely destroyed the cultivation of the coffee-tree in Ceylon.

Of **animal pests**, the most destructive, on the whole, are insects. Among these may be mentioned locusts, different species of which infest treeless regions in both the Old World and the New. From time to time they invade cultivated fields, where they arrive flying in thick solid masses, filling the air, darkening the sun, forming an immense unbroken cloud which may take more than an hour to pass. When they settle they consume every green thing to be seen, the working of their jaws meanwhile causing a sound which can be heard at a great distance. Systematic campaigns against the young locusts have lately been successful in preventing threatened devastation in East Africa. Equally sweeping in its destruction is the insect known in the United States as the army-worm, which is the larva or unwinged stage of a kind of moth, and owes its name to the fact that on the march the 'worms' all keep together like an army of soldiers, and usually advance in a straight line. Of grass or young grain that comes in their way they eat up every vestige, but when grain has grown enough to form a head, they eat only the leaves, and then climb up the stalk, cut off the head, and drop it to the ground. Among insects destructive to particular objects of cultivation may be mentioned the Hessian fly (*Cecidomyia destructor*, Say), which attacks wheat and barley, and has proved peculiarly destructive in various parts of the United States, so as to lead to the abandonment, for a time at least, of wheat cultivation in certain districts; the Colorado beetle, which wrought great ravages among the potatoes in the United States in many years subsequent to 1861; the phylloxera, which for a time put an end to the cultivation of the vine in several Departments in France (p. 145); the boll-weevils and boll-worms (really moth caterpillars), which for many years have done enormous damage to the cotton crops of the United States and Egypt. Other insects are the carriers of disease to domestic animals, as well as to human beings.

To the lower forms of animal life belongs the parasite which produces the silk-worm disease. Among destructive animals of a higher type, sparrows have multiplied so rapidly since they were introduced into Australia that they have become a regular plague to the farmer. A still more serious plague, both in Australia and in New Zealand, has grown out of the introduction of the rabbit, the multiplication of which has in some instances compelled squatters to abandon their sheep-runs, and cultivators their holdings, and has caused different Australian governments to expend hundreds of thousands of pounds in efforts to extirpate it, or rather to keep it down, since extermination seems impossible. Rats have proved

equally destructive among the sugar-canes of Jamaica. The mongoose, a small but fierce carnivorous animal somewhat like a ferret, which was introduced into that island with great success to destroy the rats, has since become almost as great a pest itself through its raids on domestic poultry. In many of these cases the most serious results have accrued where man by the introduction of plants or animals from other localities has upset the local 'balance of nature'. But in the parts of the Argentine Republic that have a similar climate to the pastoral regions of Australia, the native vizcacha, an animal with similar habits to those of the rabbit, is quite as destructive, and has likewise been the object of all sorts of devices to compass its extermination.

Minute organisms are the causes of many diseases in man which have a serious effect on production in the regions where they are prevalent, and it is fortunate that in recent years remarkable progress has been made in the knowledge enabling man to combat those diseases. Some of these organisms are conveyed to man by insects. Malaria, yellow fever, sleeping sickness, and elephantiasis all belong to this class. Malaria is almost confined to those areas in which the mean temperature exceeds 60° F. for the summer months, and on the whole it increases in virulence towards the equator. It is now known to be set up in man by a microscopic organism introduced into the human system by mosquitoes belonging to the genus *Anopheles*, and in consequence of this discovery the disease has already been extirpated in many places in which it was formerly rife. Two methods are adopted in fighting against the disease. One is to destroy the mosquito, which is done when the insect is in the larval state. In that stage it lives in water, and where the water which might rear the larvae cannot be drained away, a thin film of oil on its surface will prevent the larvae from breathing. The other method is to destroy the animal parasites in the human body by doses of quinine. The discovery of the whole process of infection threw light both on the well-known connection between the various forms of malaria, including ague, and stagnant water, and also on the fact that all marshy districts, even in warm regions, were not malarial. Even where the mosquito was present the malaria parasite might be absent.

In Cuba and in Panama, the war against yellow fever was waged with such success by Colonel W. C. Gorgas, a United States doctor, that it has now been exterminated. The insect carrier in this case is the *Stegomyia fasciata*, and the immediate excitant a microscopic spirochaete. More stubborn is the resistance offered by sleeping sickness, a disease known to have been endemic in Africa for hundreds of years. From time to time it appears to break out as a scourge, and has carried off thousands in Uganda, the Congo region, and other parts of Central Africa. It is due to an internal

parasite (*Trypanosoma*) for which the tsetse fly acts as receptionist, host, and transmitter. The main species of the fly are *Glossina palpalis*, carrier of *Trypanosoma gambiense*, and *Glossina morsitans*, carrier of *Trypanosoma rhodesiense*. The former is the better known; it was responsible for the deadly epidemic of sleeping sickness in Uganda around the end of last century. This tsetse fly, *G. palpalis*, which is almost exclusively the carrier of *T. gambiense* from man to man, is confined to the immediate vicinity of expanses of water—a limitation of habitat very helpful to anti-sleeping sickness measures. *G. morsitans* has a much wider range and serves as the intermediate host of *T. rhodesiense* not only between man and man but between animals, and also between man and animals. *Nagana*, the animal disease analogous to sleeping sickness, is even more deadly than its human counterpart, and there are vast tracts of Africa which are practically banned to livestock because of the prevalence of tsetse fly. Large sums of government money have been and are being spent on research and experimental remedies, including drugs, bush clearance, spraying insecticides from the air, and the reduction of game animals. In 1948 a tentative official claim was advanced for a new drug, antrycide, as a cure for *nagana* (see pp. 242, 630).

Elephantiasis, of which the leading symptom is a swelling of the skin and the adjacent cellular tissue, is prevalent on the coasts of West Africa, India, southern China, the South Sea Islands and Brazil. It is due to a filaria or microscopic worm carried by a group of the genus *Culex*, and has so far baffled efforts for its extirpation.

Other diseases sometimes appearing as widespread epidemics include plague, which is of two types, the bubonic, characterised by a swelling of the glands, and the lung form. Both are due to bacteria, of which the carriers are rat-fleas. There is no limit to its geographical range. The Black Death of 1348-49, which was of the lung type, raged in the high valleys of the Alps as much as on the plains, in Greenland as much as in Italy. It is diffused along the lines of commercial intercourse, but fortunately modern sanitary regulations are sufficient to cope with it, at least in the temperate zones. Cholera was long endemic from Bombay to southern China, but more particularly in Lower Bengal, and occasionally spreads like the plague along the lines of human intercourse. Again and again the great annual religious concourse at Hardwar, where the Ganges enters on the plains of India, has been the source of an outbreak which has spread far and wide, and in the latter years of last century with a rapidity which corresponded to the improvement in the means of communication. An epidemic which started there in March 1892 reached St. Petersburg in less than five months, and before the end of August reached New York. In this case the protection now afforded by good sanitation is complete. Improved

sanitary conditions have almost extirpated in Europe the once nearly universal disease of leprosy—another disease due to bacillus infection. The disease still has a grip on southern Asia, also on Africa, notably in the great river basins, and has been introduced into America. Scurvy, which at one time took so heavy a toll on seamen—on his pioneer voyage to India and back in 1497–99, Vasco da Gama lost 100 out of a crew of 160—was gradually eliminated after the discovery, in the latter part of the eighteenth century, of the means of warding off the disease by a diet of fresh fruit or fruit juices (lime juice) and vegetables. Of recent years influenza has taken a toll of human life comparable with the plagues of the Middle Ages. Indeed it is one of the serious aspects of modern life that as man's medical skill conquers one disease after another, others arise which were previously either little known or were mild in their attacks.

IV. CIRCUMSTANCES CONNECTED WITH THE EXCHANGE OF COMMODITIES

TRANSPORT. Transport methods vary considerably from country to country, and from region to region, being dependent upon a number of geographical and historical factors; they may be conveniently grouped into eight categories, as follows:—

1. Human portorage, including wheeled vehicles moved by human labour.
2. Animals, used (a) as beasts of burden; (b) for draught purposes.
3. Modern roads; and the internal combustion engine as employed in motor-cars, omnibuses, and lorries.
4. Railroads, including (a) light trackways and tramways; (b) railways proper, worked by steam, electricity, or other method.
5. Ropeways and cableways.
6. Inland water transport—rivers and canals.
7. Ocean transport.
8. Air transport.

1. **Human portorage.**—In central Africa, in various parts of south-eastern Asia, and even in densely peopled districts of China, the movement of goods overland still takes place to a large extent by means of human porters, or by wheeled vehicles drawn or pushed by men. Prodigious loads are sometimes carried under exceedingly difficult climatic and topographical conditions by coolies, as in the tea traffic between south-west China and Tibet, where the normal load per man is 200 lb., and two mountain passes more than 7,000 feet above the level of the starting-place have to be scaled; about 120 miles are covered in some twenty days. The wheel-barrow is still in common use in northern China, where

human labour is cheaper than animal labour, and where every inch of the land is so precious that the narrowest possible roads are used, such as will accommodate a wheel-barrow but not a two- or four-wheeled cart. Human labour was also the principal means of transport in Japan until the revolutionary changes of the past half century.

2. Animals.—Even in the most highly civilised countries animal transport is still of great importance, especially in rural districts, though in general it may be said that in those countries where western civilisation has advanced furthest, mechanisation of transport is tending more and more to displace the animals. In most European countries, and in those which have derived their civilisation from that of Europe, by far the most serviceable animal is the **horse**, used as a draught beast, but in central and eastern Europe the **ox** is of greater importance—perhaps a comment on the greater velocity of life in the West, the horse being valued for its speed, the ox for its strong, steady, if rather leisurely, pull. In southern Europe, and the regions round the Mediterranean generally, the **ass**, which thrives better than the horse on the scanty herbage, is an animal of much more consequence than in the rest of Europe, and hence is more cared for and of finer aspect and better qualities; but in the mountainous parts of those regions the **mule** is preferred to both on account of its sure-footedness and endurance, and to the ox on account of its sharing with the ass the power of thriving on coarse browsing. These qualities have secured the introduction of the mule (which was used by the ancient Greeks) into all mountainous countries with a moderately warm and dry climate, both in the Old World and the New.

In the most populous parts of Asia and in central Africa various breeds of oxen are the principal beasts of burden; and next to these, in Asia, come **buffaloes**, horses being for the most part neither numerous nor of good quality. The water-buffalo is also found in south-eastern Europe.

Among animals of regional importance, **reindeer** are used in northern Asia, Europe, and North America, notably to draw sledges over the snow-covered ground; **dogs** are also employed, as by the Eskimos, for the same purpose. In the mountainous parts of central Asia, including the Himalayas, a peculiar species of ox, known as the **yak**, which is found both wild and domesticated, and is characterised by long fine silky or slightly curly hair hanging down from various parts of its body, is used as the mule is used in southern Europe. In some parts of the same region **goats** and **sheep** are employed for the carriage of light burdens, and goat-carts may still be seen in the Alpine region of Europe. In the Andes of South America, the **llama** is the principal beast of burden. The Asiatic **elephant**, which haunts the forests of south-eastern Asia from the

south of the Himalayas to the borders of China, and the large tropical islands from Ceylon to Sumatra and Borneo, is invaluable as a beast of burden throughout that region, wherever there are no proper roads. Where roads do exist, it does not accomplish so much work in proportion to the amount of food which it consumes as the horse, ox, or buffalo, but it can make its way across marshes and through forests which could not be traversed by any of the other animals mentioned. Throughout India, the catching of wild elephants for training is under government supervision; the chief area is now, however, in Burma, where the animals are used mainly for timber haulage in the forests. The African elephant is rarely trained for labour, though it was so by the ancients (*e.g.* the Carthaginians), and, in north-eastern Africa, down to the Middle Ages.

The **camel**, in desert and semi-desert regions, is even more indispensable as a beast of burden than the elephant amidst forest and marsh. Provided with one or two humps of fat, which serve as reserves of nutriment, and with its stomach lined with hundreds of little cells or compartments capable of holding water, a camel when well fed and supplied with water at starting can accomplish immense journeys on the most meagre fare, and almost without drink. By no other animal is so much merchandise carried over long distances. Until the recent advance of the motor-car and the aeroplane, it was the sole means of commerce between the oases of northern Africa, as well as between the North African coast and the fertile territories of the Sudan, and it is still largely employed in western Asia. It was introduced into Australia, and was used on exploratory journeys, but has been replaced now by the motor-car. Camels were seldom used singly, but in caravans, often consisting of several hundreds, not only for the sake of carrying a large quantity and variety of merchandise, but also for the sake of having a sufficiently large body of men to defend the caravan against marauders.

The simplest method of using animals for transport is to employ them as beasts of burden, like the pack-horses which formerly carried most of Britain's internal trade; but this method is far from being the most efficient. An immense advantage is gained by employing the beasts to draw wheeled carts. One animal, broadly speaking, can pull at least four times as much as it can carry. Even in roadless and trackless country, teams of oxen, as in South Africa and in the Argentine, are employed to haul agricultural produce in strongly built wagons. For the most part, however, the use of wheeled vehicles involves the making of roads.

3. Roads.—The development of road vehicles during the last 150 years, and the rapid progress of new methods of transport during the present century, have involved vast changes in the technique of road construction.¹ Roads that were adequate in

¹ See J. W. Gregory, *The Story of the Road*. London, 1931.

foundation, surface, and width for the meagre traffic of horse-drawn carts a hundred years ago are almost useless for modern high-speed motor traffic. Until comparatively recent times most roads have been dependent upon locally obtained raw materials for their construction; consequently, in clay areas, where natural road-metal is absent, communication was apt to be difficult in winter because of mud, and unpleasant in summer on account of dust. This is still to a large extent true of considerable areas of the earth's surface, such as the Hungarian Plain, western Siberia, and the plains of Australia and the Argentine. There are many well-known descriptions of eighteenth-century English roads running across the clay belts of this country to be found in the works of travellers such as Defoe and Young. Heavy lumbering carts with their numerous horses cut the roads into deep ruts, and the laying of stones only served to make progress more dangerous and uncomfortable for travellers on horseback or in wheeled vehicles. Under such conditions it is not surprising that Edinburgh was 10 to 12 days' coach journey from London, Exeter 4 days, Birmingham 2 days, and so on. It is true that the formation of the Turnpike Trusts, which devoted part of the toll-money collected from vehicles to the maintenance and improvement of the road surface, helped to improve many of the main roads of Britain, but little real advancement was possible until scientific principles, which had been almost dormant since the building of the Roman roads, were introduced into road construction. The two names most deservedly famous in this connection are those of Telford and Macadam, two Scotsmen who laboured in the early part of the nineteenth century.

Telford's method consisted of laying a foundation of solid stone blocks and covering this with a layer of small broken stone, thicker in the middle than at the sides so as to produce a camber which, with the provision of adequate ditches on each side, would effectively drain the road. He spent eighteen years in the Scottish Highlands building over 900 miles of roads and, in addition, is justly famed for his reconstruction of the Shrewsbury-Holyhead road during the years 1815-30. Macadam's system was based on the principle that if a road is made of suitable material and is well drained it can be laid on the natural subsoil without the intervention of Telford's costly stone pavement. His roads were made of a sheet of broken stone of uniform size, each piece an inch or two in diameter, the road being cambered to throw off surface water. He found that such a sheet of broken stone, after rolling by traffic, became firmly bound together as an impermeable mass, and so resisted the ravages of water. Limestones, which yield a fine powder when pieces are ground together, were found to be the most suitable rock; rain-water and this powder formed a natural cement—or the process could be hastened by a light road-roller and a water-cart.

Both Telford's and Macadam's roads were effective so long as horse-drawn wagons with iron-tyred wheels formed the bulk of the traffic. So soon, however, as the perfection of the internal-combustion engine permitted the development of the motor-car, they became inadequate owing to the unsuitability of their surface. A rubber-tyred wheel, caused to rotate by an engine, exercises a disruptive effect upon a road surface composed of small stones, especially during wet weather, when the rubber acts as a sucker and pulls out any loose stones; whilst the dust raised by the passage of swiftly moving vehicles in dry weather rapidly becomes an intolerable nuisance, as it does in those parts of the world, such as south-eastern Europe, where the motor-car has preceded the construction of suitable road surfaces. The removal of the fine dust particles, too, contributes to the rapid disintegration of the road surfaces. A motor road requires a surface so coherent that it resists disruption by the uplifting of stones by the tyres, and the scattering of the finer particles as dust. Such surfaces are usually prepared either by the use of concrete, as in America, or, as is more commonly the case in Britain, by employing 'tarmacadam'—broken stones coated with tar—sealed with tar or bitumen. The use of tar on roads was one of the first remedies for the problem of dust; the tar also acts as a waterproof coating and so delays the decay of the road through the penetration of water and the disruptive action of frost. In America heavy oil is used in the same way.

Many varieties of stone can be used for the purpose of road-making, but limestones and close-grained igneous rocks, such as basalt, are the most reliable. Coarse-grained rocks, such as granite, do not make good macadam because the large individual crystals tend to crack; granites are, however, successfully employed in rectangular blocks called 'setts', especially in industrial districts where much heavy traffic has to use the roads. The unequal weathering of the constituent crystals keeps the surface slightly rough, and so suitable for horse traffic. Blast-furnace slag, crushed into pieces and tarred, is also much used for macadam in districts where it is produced. Gravel is also commonly used where it is available, especially as a surfacing material.

There is no doubt that the modern motor road is unsuitable for horse traffic, owing to its smoothness. In rural areas the difficulty is sometimes resolved, especially on hills, by the provision of a rougher macadam trackway on either side. Latterly however, a rough surface has been shown to prevent skidding by motor vehicles. In cities there are increasing signs that horse traffic may eventually, owing to its slowness, be severely restricted, if not entirely prohibited.

Some idea of the extent of road traffic at the present time may be gained from statistics published by the Society of Motor Manufacturers and Traders. The world total of motor-cars and commer-

cial vehicles in use in 1951 was nearly 74m.—a quarter of them coming within the latter category. The United States had far and away the largest number—51½m., or more than two-thirds of the total. Cars alone in the United States numbered 42m. or roughly one for every four of the population. The United Kingdom came second with nearly 2½m. cars (one in 21 of the population) and a little more than a million commercial vehicles (one in 63). Compared with pre-war figures (1938) the United States total of cars and commercial vehicles showed an increase of 75 per cent., and the increase in the world total was not far short of the same. It is significant that while the number of cars declined during the war years in Europe, Asia, and Africa, the number of commercial vehicles everywhere increased. Under the stimulus of both World Wars, the building of lorries has grown by leaps and bounds, and both in the 'old' and in the 'new' countries this type of vehicle now plays an important part in everyday life. In Britain the motor lorry, by providing cheap and fairly rapid door-to-door transport of small loads, has made great inroads into the traffic formerly carried by the railways (cf. pp. 352 *et seq.*); in countries less well covered by a rail-net, and in countries, such as the 'pioneer belts' of Africa and elsewhere, where the railway has not yet arrived, this vehicle is of great help in promoting economic development. Rough roads that will carry a lorry are far more cheaply and quickly constructed, and much less trouble to maintain, than are railways. The use of six wheels instead of four, and the mounting of vehicles on 'caterpillars', are devices that have been developed to overcome the difficulty of rough pioneer roads.

Finally, the motor-omnibus, capable of carrying anything from one to six dozen passengers, has done much to promote the spread of intercourse between rural and urban areas, and has been an important factor in the outward spread of large cities such as London. There is a tendency for omnibuses to replace trams (pp. 87–88) in many towns nowadays, both in Britain and on the Continent.

4. Railways.—The difficulty of hauling large quantities of bulky commodities over the ordinary country roads in the days before Telford and Macadam was responsible for the growth, in the eighteenth century, of numerous railways in the coal-mining and iron-working districts of Britain, especially in Northumberland and Durham, where the boulder clay soil provided an indifferent foundation and where gradients down to the rivers were steep. Even the Romans had laid stone tracks for their wagon-wheels; it was a short step from this to the laying of timber baulks covered with iron plates (hence the term 'platelayer', still employed on our railways for track-maintenance men) and so to actual iron rails, flanged to keep the wheels from slipping off. Transfer the flanges from the

rails to the wheels, and the idea of the modern railroad is complete. Between 1801 and 1825 no fewer than 29 'iron railways' were built in Britain, mainly in connection with collieries, ironworks, or canals (p. 90), horses being used as the means of hauling wagons along the rails. The coincidence of this period with that of the development of the steam locomotive has produced the railways that we know to-day. James Watt began building stationary steam engines on a commercial scale in 1775, and between 1801 and 1825 such men as Trevithick, Hedley, and Stephenson were responsible for applying Watt's invention to the problem of locomotion. The first steam railway for general purposes was that between Stockton and Darlington (really designed to give an outlet to the Tees for the coal from Witton Park in Durham) opened in 1825. The Liverpool and Manchester line followed in 1830. In 1831 the first passenger train ran on the American continent—from Albany to Schenectady in the state of New York; and in 1835 the first railway on the mainland of Europe was opened, between Brussels and Malines.

Topographical controls of railway routes are more obvious than those affecting roads. The problem of the railway-builder lies midway between those of the road engineer and the canal builder. High-speed express-train working becomes difficult when frequent gradients steeper than about 1 : 100 are encountered—though it is possible to work trains by the normal method up gradients of 1 : 22, as on the Kicking Horse Pass line through the Rockies. It has been estimated that the cost of working a given train-load over a mile of track on a gradient of 1 : 50 is twice that of working the same train over a mile on the level. Hence the most elementary factor in geography—the relief of the land—is of great importance in controlling the routes which the lines shall take. In Britain the Tyne gap, Aire gap, and Shap routes may be cited as examples of the intimate control of railway routes by physical features; one may notice also that railway routes frequently do not follow the lines of the roads which preceded them. Thus the railway across the Cheviots does not follow the course of the old road connecting the valleys of the Rede and the Jed across Carter Bar; farther afield, it may be recalled that the railway from Florence to Bologna does not follow the old direct route across the pass of La Futa; the line from Sofia to the Maritza valley does not follow the Roman road through Trajan's gate, and so on.

The superior utility of railways over roads has in many cases justified a vast expenditure in subduing the face of nature in order to make routes for the lines where the features of the country did not afford them. Railway tunnels from 7 miles to over 12 miles long have been driven through the Alps, and in the Andes heights of over 15,800 feet are reached by railways in Bolivia (on the metre-gauge line from the Chilean port of Antofagasta) and in Peru (on

the standard gauge Central Railway). In mountainous countries, too, abnormal types of railways have made their appearance; notably rack-railways, of which type the Abt system is most commonly used, in which the locomotive can use the rack or toothed rail on steep sections (even on gradients as steep as 1 : 2) and on level tracks can proceed in the ordinary manner. The first mountain rack-railway was that up Mount Washington in New Hampshire, U.S.A., completed in 1868. Since that date numerous examples have been built in various parts of the world, especially in Switzerland. Many such railways have been built for purely tourist purposes, such as the Snowdon Mountain railway, but one European main line, the connection from the Adriatic coast to Serajevo, employs the system in its ascent of the Dinaric Alps, and so also do several main lines in South America—as from Arica to La Paz.

Mountains are not the only obstacles to continuity of railway lines. In order to extend the facilities for communication by rail without break of bulk, even wide stretches of sea and lake are in some cases crossed by train-ferries: specially constructed vessels with rails laid on their decks, carrying whole trains. The channel separating Denmark from Sweden has long been overcome in this manner; for some years a goods train-ferry has been in operation between England and the Continent *via* Harwich, and in 1936 the first passenger ferry service between London and Paris was opened *via* Dover-Dunkerque.

The mode of development of a railway system or net may take on two quite different forms, according to whether the country is an undeveloped or a long-settled region. In a virgin area, like the Canadian prairies seventy years ago, large-scale settlement is almost impossible owing to lack of means of communication. Thus, until the completion of the Canadian Pacific Railway in 1885, western Canada was practically uninhabited, and settlement closely followed the first lines of railway. In such a case the railway may quite definitely be said to have developed the country; even to-day little wheat is grown more than twenty miles from a railway. In the same way the railway lines of the Argentine Pampa, and of the Middle West of the United States, have provided a basis for settlement. Quite different is the state of affairs in an already developed country such as Britain. Here the railway routes were dependent on pre-existing conditions—the distribution of population, especially the position of towns and industries, and the existence of developed natural resources, such as minerals and harbours. The initial function of the railway in this country—which had so recently undergone a rapid transformation consequent on the 'Industrial Revolution'—was that of connecting places which were already important. The lines at once stimulated the industries of the regions they served, and this growth encouraged the construction of further

rail connections. Junction points began to attract population and industry, and at certain junctions whole new townships sprang up, such as Crewe and Swindon. The railways, too, helped to foster the growth of their seaport terminals, and in several cases were responsible for the entire construction of new ports, such as Southampton and Immingham.

Geographical factors affect in various ways the working of railways. It is obvious that a railway locomotive must haul the vehicles containing the load as well as the load that has to be transported, but it is only the load on which freight is earned. Hence it is desirable to have a railway wagon reasonably light in proportion to the paying load. Large wagons present this advantage, so that the use of large wagons is economic where sufficient loads can be regularly obtained for them. But it is not everywhere that convenient loads for large wagons and long heavy trains are available. Where there is a large amount of bulky goods such as grain, coal, ores, and timber to be conveyed to single points the advantage of large wagons is great, and it is greatly enhanced when there are such loads in both directions. It is said that the idea of reducing transport expenses by the adoption of larger wagons originated in the grain-growing regions of the north-west of the United States. Much has been said for many years on the advantage of introducing large railway wagons into Great Britain, but the problem where wheat is grown in enormous quantities and mostly transported to one or two great markets, is entirely different from that of collecting wheat in forty or fifty counties and redistributing it in ten thousand towns and villages. In America it has been found profitable in some cases to use 50-ton steel trucks, nowhere more advantageously than on the lines connecting Pittsburgh with the lake ports, where the trucks can be filled in one direction with iron ore, and in the other with coal. There it was estimated that the substitution of these trucks for the older 30-ton wooden ones effected a saving of 315 tons dead weight on a 1,500-ton train, and one of nearly £9,500 in freight on thirty double journeys in the course of the year.

On the continent of Europe trucks are employed which are smaller than those in ordinary use in America, but larger than most of those in Britain, where the normal size is twelve to thirteen tons. Though the British and Continental track gauges are the same, the original British structure gauge (based on the size of a load of hay, and governing the dimensions of tunnels, etc.) does not admit of the use of the wider Continental rolling stock. Before the British railways were nationalised (see p. 356), the Great Western Railway introduced trains of 20-ton wagons (each $24\frac{1}{2}$ feet long by 8 feet 8 inches high) for the carriage of coal from South Wales, and a similar experiment was tried still earlier by the old North-Eastern

Railway. Even 40-ton trucks have been used; but the experiments have not been generally successful under the conditions obtaining in this country. There are nearly 7,000 goods stations in Britain, and to nearly every one of these a truck may be sent every night, in many cases carrying only from half a ton to two tons. Since nationalisation, the British Transport Commission, which became operative on January 1st, 1948, has adopted 16-ton all-steel trucks as the standard of replacement for mineral wagons.

Where the conditions favour heavy traffic, great savings can be effected by having long trains even though these may be made up of small trucks, but the savings of course are all the greater where there are long trains of large trucks. Long trains also are more common in America and on the Continent than in Great Britain, and for the same reasons as large wagons. It is to promote this economy that certain railway centres in America, known as basing-points, are made the foci of railway rates for large districts round, goods being carried between these points at exceptionally low rates, and the rate being thus cheapened for the whole district served from any focus.

In the early days of railway construction several gauges were used, but since the abolition of the G.W.R. broad gauge in Britain in 1892, all main lines have been on the standard gauge of 4 feet 8½ inches. This is also the gauge of continental Europe (except Spain and Russia), and of North America. Several countries, notably Australia, Argentina, and India, suffer from a mixture of gauges.

The construction of light railways, by which are usually meant railways so constructed as to involve comparatively small original cost and outlay for upkeep, has been carried on in France since 1865, and in other continental countries as well as the United States from later dates. The Belgian system, begun in 1885, is one of remarkable completeness, utilising, to a large extent, the country roads. In 1896 an Act was passed in this country authorising and regulating the construction of light railways, but fortunately little was done before the internal combustion road vehicles began to develop so rapidly as to render most light railways obsolete.

About 1870 began the extensive development of **tramways** as passenger carriers in Britain. Nearly all the original tramways were private enterprises and the vehicles were horse-drawn. In 1882 an Act was passed enabling local authorities to purchase any electrical installation at the end of twenty-one years without making any allowance for goodwill. This, and other deterrent legislation, hindered the application of electricity to tramways in Britain, and though the term was subsequently altered in 1888 to forty-two years, the influence on investors remained. In 1928-29 there were 221 tramway undertakings and 2,420 miles of track in Britain, and the number of tramcars was over 14,000. By 1938 the mileage of tram-

ways and light railways was down to 1,183 and the number of tramcars was under 9,000. By 1953 the number was under 3,500. It is clear that British towns have taken the lead in abolishing trams in favour of the more flexible motor-omnibuses. In some areas the rails have been removed but the overhead electrical installation is still used to drive 'trolley buses'. In America it is the privately owned motor-car which has rendered almost useless the street-car systems.

On the whole, Britain has hesitated to adopt main-line railway electrification, but after the First World War the Southern Railway developed the largest electrified suburban railway system in the world, and electrified the main line to Brighton and some other South Coast resorts. The system used is the third-rail system.

5. Ropeways and Cableways.¹—For general transport duties and especially for refuse disposal, ropeways are of great advantage. The main feature is that the loads, up to five tons weight, are suspended from an overhead rope or ropes and are carried clear of ground conditions. There are two systems—the Monocable for duties up to 150 tons per hour, and the Bicable for duties up to 500 tons per hour with individual loads of up to five tons. With the Monocable system an endless haulage rope runs over sheaves mounted on trestles and serves both to support and to transport the load. The Bicable system utilises a fixed carrying rope and a light haulage rope to move the cars which run on the track rope. Bicable ropeways can be entirely automatic in action and angles can be introduced on the line at any point. The ability to transport materials over obstacles which either forbid alternative transport or cause excessive detours is one of the major features of ropeway practice.

A cableway is a specialised version of a ropeway and serves both to lift and traverse a load. Because of the very long spans which are possible and the high speed of operation, cableways are universally used for dam construction and are often used for stock-piling and general duties. Loads may be up to thirty tons.

The pneumatic transmission of telegrams in light boxes through tubes by increasing the atmospheric pressure or diminishing it (by suction) was adopted as far back as 1853, and in 1913 the system was extended by the London Post Office to parcels.

6. Inland Water Transport.—Water carriage has, within the last hundred years, undergone as great a revolution as land carriage. The simplest form of water carriage is that in which rafts are allowed to drift down the course of a river. The use of boats on rivers, both for down- and up-stream navigation, must, however, have been one of the earliest of human inventions; and in some parts of the world, as in Russia and the valley of the Ganges, the want

¹ With acknowledgments to the Chairman of the Aerial Ropeways Association.

of roads was, to a large extent, long made up for by the abundance of navigable rivers. Such rivers being means of transport given wholly or largely by nature are apt to have their importance exaggerated in the minds of geographers, but it should now be recognised that nature has generally done more for a country in providing it with facilities for railway construction than with navigable rivers, in so far as these are merely inland waterways and not, so to speak, extensions of the seaboard, that is, directly accessible to sea-going vessels. Railways have the advantage over rivers not merely of greater speed, but the even greater advantage of intercommunication with different parts of the country, and these advantages in most cases more than compensate the disadvantage of dearer haulage. And with respect to intercommunication with different points, it is important to note that a railway generally has a great advantage even over a river on a parallel course. A waterway is of no use unless there are places on it where goods may be landed and lifted, but good navigable rivers are apt to flow for long stretches through marshy and unstable country without landing places. It is this character that greatly diminishes the value of the Po as a waterway, and the Mississippi flows in places for mile after mile without the possibility of discharging goods, where the parallel lines of railway have numerous stations. The utility of a river as a waterway is, moreover, affected by the weather to a much greater extent than are railways. Nearly all rivers are subject to great variations in level. The St. Lawrence is in this respect an exception, as the steadiness of its flow in the open-water season is maintained by the chain of great lakes of which it is the outlet, but it is a unique exception. Hence traffic on most rivers is apt to be stopped or impeded by high and low water, high water rendering them unnavigable on account of their impetuosity, low water from inadequate draft. Then again, where the winter is severe there is a regular stoppage of traffic through ice. Nevertheless, large rivers on which steamers can be used still form important means of communication, and especially in countries not yet fully opened to modern commerce. The best of such rivers have one great advantage over railways, that it is easier on them to transport great quantities at one time. A train load of more than 7,000 tons—considerably less in the United Kingdom—may be regarded as something quite exceptional, but on the Rhine, for instance, it is easy to exceed that in barge-trains. If they served no other purpose they would still be of commercial value as tending to keep down rates on competing lines of railway.

Navigable canals are another means of transport dating from the unrecorded periods of human history, and they also have had their importance diminished by the introduction of railways, though in some regions they have played a very important part in the development of commerce. Level countries and regions are naturally

those which abound most in canals, and in such, one of the chief uses of rivers is to feed navigable canals, as in more mountainous districts one of the chief uses of rivers is to afford water-power. The most important canals of modern times, however, are the **ship-canals** connecting different seas.

Somewhat delusive expectations of economy in transport from the use of inland water carriage are sometimes entertained. These are all based on the admittedly low cost of mere haulage at a slow rate. It is estimated that on an ordinary good wagon road a single horse-power will drag about 3,000 lb. at the rate of 3 feet per second (approximately $1\frac{1}{3}$ tons at two miles an hour); on a railway about 30,000 lb. ($13\frac{1}{3}$ tons) at the same rate; in water up to as much as 200,000 lb. (90 tons). But in making inferences from this general fact it should be borne in mind (1) that the cost of increasing the rate of speed is much greater by water than by land; (2) that the average rate of transport on canals is greatly reduced by the delays at locks; (3) that the economy of water transport is greatly reduced by the fact that even canals do not afford the same facilities as railways for conveying goods over the face of the country without break of bulk; (4) that canals are in most cases of too small dimensions for modern requirements; and (5) that the maintenance of an adequate supply of water in canals may be difficult and expensive.

With regard to the first of these points it is noteworthy that some of the earliest experiments with steamboats were made with the view of increasing the speed and economy of transport on canals. Since the screw propeller was introduced, these experiments have been renewed with greater success, seeing that its use is not so likely to injure the canal banks. To prevent destruction of the banks, mechanical propulsion is prohibited on many canals, including some of those of Britain. In other cases concrete banks have been made. A few attempts have been made to increase the speed by the use of locomotives on the canal banks. This mode of traction was tried on the Forth and Clyde Canal in 1839, steam locomotives being used. More recently electric motors running on rails on the banks have been employed both in France (on the Burgundy Canal) and Belgium (on the Charleroi Canal); but in the latter case the experiment has been abandoned. This method is, however, used in taking vessels through the locks of the Panama Canal. Electric propulsion with the aid of overhead wires has been tried with success on a section of the Staffordshire and Worcestershire Canal. The current consumption, with a load of 33 tons, was found to be one unit per mile; the cost, at 1d. per unit, 0.03d. per ton-mile.

In view of the importance of the second consideration above mentioned, the map (p. 354) of the English waterways has been drawn up so as to show the numbers of locks. The delays due to this cause have given rise to various projects for economising time

in surmounting differences of level in inland navigations. Hydraulic and pneumatic lifts are employed. In 1875, an hydraulic lift, with a lifting power of 100 tons, working through a height of 50 feet, was completed to connect the Weaver navigation at Anderton, in Cheshire, with the Trent and Mersey Canal. It has since been rebuilt and electrified, with two single tanks. A more complicated structure, with a capacity of nearly 600 tons and a somewhat higher range of working, was completed in 1899 on the Dortmund-Ems Canal at Henrichenburg not far from Dortmund. Inclined planes have been employed from a very remote date in China. In April 1910 the Grand Junction Canal substituted inclined planes for the flight of ten locks which formerly overcame a height of 75 feet at Foxton in Leicestershire. The boats ascended and descended inclined planes simultaneously in wet docks which moved up and down on rails, a stationary steam-engine effecting the lift. By this means two boats were moved up and down simultaneously in 12 minutes, while formerly one hour and 20 minutes was required for passing a couple of boats in either direction. The Foxton lift was closed in November 1910, as there was not enough traffic to warrant the cost of working it.

The difficulty of intercommunication by inland waterways without break of bulk arises from the fact that it is not practicable to construct canals in as many directions as railways, and the full advantage of such intercommunication, even where it is possible, can in many cases not be enjoyed, owing to the inevitable differences in canal dimensions. The larger the waterways the greater is the economy in the transport, but the construction of large canals is in many cases quite impracticable, in many others not economically practicable.

7. Ocean Transport.—Marine navigation is the mode of navigation which presents the greatest combination of advantages. Besides the advantage of cheap haulage for low speeds offered by navigable water generally, the ocean offers a free road traversable in all directions, one on which it is possible to increase almost indefinitely the size of vessels, the size being limited mainly by accommodation available at ports and the dimensions of such canals as Suez and Panama. These advantages far outweigh a somewhat greater risk of loss at sea than on land from storms and other causes. It is in this mode of water carriage that the most important developments have taken place in modern times. These developments affect the size of the vessels employed, the range of navigation, the precision with which a course can be laid down and followed, and the power used for propulsion.

The navigation of the sea in small boats for trade purposes is not yet quite extinct. The islanders of the Pacific Ocean and the Eastern Archipelago undertake short voyages in a great variety of

small boats, and some of the islanders in the trade-wind region of the Pacific regularly set out in fleets of small boats on long expeditions, in which they go far out of sight of land, guided only by the constant direction of the low waves caused by the steady wind. Such adventurous enterprises unaided by the modern appliances for navigation are, however, the exception. In ancient times the Phœnicians were the most adventurous seamen, at least in European waters. About 1000 B.C. their vessels traversed the entire Mediterranean, and even went beyond the Pillars of Hercules (Straits of Gibraltar), possibly as far as the Scilly Isles; and about the beginning of the sixth century B.C. Phœnician seamen in the employment of Pharaoh Necho, King of Egypt, are credited with having made a voyage round Africa. But the most adventurous of their expeditions were mainly coasting voyages. Ancient writers of the first century A.D. mention as something recent the discovery of the use that could be made of the monsoon winds in sailing from the mouth of the Red Sea to India at one period of the year and back at another. It is at least certain that a trade of this nature was regularly organised within that century, though even these voyages were probably not wholly on the high seas. Before the close of the Middle Ages, however, vessels sailed with the monsoons from the east coast of Africa direct to India and Ceylon.

In modern times ocean navigation has been greatly facilitated by the use of the mariner's compass. This instrument, there can be no doubt, was known to the Chinese at a much earlier date than to Europeans. So far as can be ascertained, it was first known in Europe towards the close of the twelfth century. The Neapolitan Flavio Gioja (with doubtful warrant) gets the credit of having improved it in the fourteenth century, and since then it has undergone a long series of improvements, especially in the nineteenth century, when the increasing use of iron in shipbuilding rendered it necessary to devise methods for neutralising the disturbing effects of that metal on the compass needle. It was not till sailors became accustomed to this instrument that they became bolder in their ventures. The Portuguese voyages in the fifteenth century, which added greatly to the knowledge of the west of Africa, were still for the most part coasting expeditions. It was in the last decade of that century that Columbus discovered America (1492), and Vasco da Gama the sea-way to India (1497-98)—a discovery hardly less important in the history of commerce, on account of the effect it had on the fortunes of the great trading centres of Italy and southern Germany.

For hundreds of years after the first use of the compass in Europe mariners were still without the means of determining with precision their course on the high seas. Improved chronometers, almost as indispensable for this purpose as the compass, date only

from 1736, following John Harrison's invention of the compensation pendulum.

Steam navigation, by which so great a revolution has been effected in sea-carriage, originated, like steam railways, in the nineteenth century. Trials of steam-engines for the propulsion of vessels were, indeed, made before the end of the eighteenth century. But the patent for the first steamboat which proved a success, so far as locomotion was concerned, was taken out in 1801 by Symington, and a boat constructed on this patent had a few trials on the Forth and Clyde Canal. The first really successful steamboat voyage was that made in 1807 from New York to Albany on the Hudson in a vessel constructed by Fulton, who had worked independently on the problem of steam navigation since 1803. In 1819 a ship crossed the Atlantic using steam as an auxiliary, and in 1838 two ships, sailing about the same time from Cork and Bristol respectively, made what are considered the first commercially successful steam-voyages across the Atlantic. In 1820 an iron vessel made a voyage from London to Paris, and in 1832 an iron vessel, the *Elburkah*, made the voyage from Liverpool to the Niger.

About the middle of last century steamers began somewhat rapidly to displace sailing vessels, and in the sixties iron came to be more and more substituted for wood as the building material. The invention of mild steel (p. 283) made it possible to use steel in place of iron, and this material was first used in the Cunard liner *Servia* in 1881. The great advantages of iron or steel vessels over wooden ones are their greater strength, endurance, and lightness in proportion to the load. Wooden vessels seldom lasted for more than 12-15 years, whereas the life of a steel vessel may exceed 40 years. The weight of a wooden ship was nearly as great as that of its cargo, whereas a steel vessel can carry a load of from two to four times its own weight; river steamers, which are not so strongly built, an even larger proportion. Formerly the proportion was greater in sailing vessels than in steamers, in which latter a large amount of room is required for the machinery and the fuel. This is one reason why the sailing vessel is still used for certain purposes.

Early in the present century, motor-ships were introduced as an alternative to steamships, and an oil-tanker registered in 1911, the *Volcanus*, was the first ship to be driven by a Diesel oil-engine running on the heavy crude oil which is a distinguishing feature of that type of motor vessel. As we shall see presently, motor and Diesel ships have since found increasing favour, though steamers still constitute by far the greater part of the world's shipping tonnage.

During the First World War the introduction of reinforced concrete (concrete strengthened internally with steel rods) as a building material, and of prefabricated ships (made up of parts manufactured at inland steel works and put together on the coast), had

some influence on the local distribution of the shipbuilding industry. Concrete ships of upwards of 1,000 tons burden were constructed in large numbers during that War, when the saving of steel was important; but they have not come into general use since then, nor have prefabricated ships.

Here may be noted the meaning of tonnage. Cargo tonnage is taken to be the weight of cargo carried, expressed in long tons (2,240 lb.) or short tons (2,000 lb.). Actually 40 cubic feet of cargo is normally reckoned as equivalent to 1 ton. Gross tonnage refers to space measurement, not to weight, 100 cubic feet being reckoned as 1 ton; it is the capacity of the entire space between the frame of the vessel and the deck, together with any closed-in space above deck. Net or register tonnage refers also to space measurement, but from the gross tonnage is deducted the space occupied by engines, gear, crew's quarters, and officers' quarters; it represents, indeed, the space available for cargo and passengers. As in gross tonnage, 100 cubic feet are reckoned as 1 ton. Displacement tonnage refers to the weight of water actually displaced by the vessel when fully laden; it is really the weight of the vessel and its contents when fully laden.

There has been a steady increase in the size and speed of vessels, especially passenger vessels, built for the great routes of commerce. The ships in which the great voyages of discovery were made in the fifteenth and sixteenth centuries were, according to our standard, very small. The largest of the three caravels with which Columbus discovered the New World was of only 100 tons burden (cargo tonnage). But let us not be misled by such figures as to the average dimensions of the merchant vessels of the period. Small vessels were often purposely chosen for voyages of discovery, as being better fitted for the exploration of unknown coasts. This is still true in Antarctic exploration. Even in the twelfth century, an average-sized merchantman in the Mediterranean appears to have had accommodation below deck for about 250 tons of cargo, besides a considerable cargo above deck.

Nowadays, ordinary cargo steamers ('ocean tramps') are built with a cargo capacity (dead weight) of 5,000 to 9,000 tons, and to run at a speed of 10 to 11 knots. The average liner is of more than 10,000 tons burden; and so greatly has the speed been increased, that the average of such liners is from 12 to 16 knots or nautical miles per hour. The largest ships are many times that size and twice as fast. In 1939 two liners of over 80,000 gross tons were regularly crossing the Atlantic, and a third was nearing completion. The first of these, the French *Normandie* (83,423 tons), launched in 1935, set up a new record for the transatlantic crossing, with an average speed of over 30 knots per hour, but the 'Blue Riband' of the Atlantic was wrested from her in 1938, when the British *Queen Mary*

(81,235 tons) made the crossing at the rate of 31·69 knots. The third and largest, the British *Queen Elizabeth* (83,673 tons), saw her first service as a troopship in the Second World War, and the other two mammoths were among the many great merchant ships used for that purpose. All three survived the war, but soon afterwards the *Normandie* was destroyed by fire in New York harbour.

Since then the 'Blue Riband' has been captured by a smaller but more heavily powered vessel, the *United States*, built not only for passenger and cargo traffic but for possible war service. With a tonnage of only 52,000, she crossed the Atlantic on her maiden voyage in July 1952 at the average speed of 35·59 knots, covering the 2,942 nautical miles between the Ambrose Light-vessel and Bishop Rock in 3 days, 10 hours, and 40 minutes. On the return voyage the speed averaged just over 36 knots.

From the mammoth 'Queens' there is a big drop in gross tonnage to the next largest liners, which are the *United States*, as noticed above, and the French *Liberté* (formerly the German *Europa*), 49,746 tons; but there are half a dozen with a gross tonnage of between 30,000 and 45,000, and many more between 20,000 and 30,000, including the largest motor ship, the *Britannic* (26,943 tons).

The increase in the size of steamers has been, in part, a natural result of the increase of speed. The more rapid rate of progress has been achieved, to a large extent, at the expense of an increased consumption of coal or oil; so that on a long voyage a large amount of space is required merely for the accommodation of the fuel. But the higher speed is not solely due to this cause. Improvements in the construction of marine engines have in some cases given increased speed with economy of fuel. One of the most important of these improvements was the invention of the tri-compound or triple-expansion marine engine, in which the steam is passed in succession into three cylinders, so as to act on three pistons and utilise its expansive force to the utmost. By such improvements the consumption of fuel had in 1897 been reduced since the early days of steam navigation from between 5 and 7 lb. to about 2 lb. per indicated horse-power per hour. In recent years the steam turbine has been applied almost universally in marine engines. In such engines the steam, instead of acting on opposite sides of a piston reciprocally, is made to impinge continuously on a series of blades fixed to a revolving drum. By such an engine a speed of upwards of 36 knots was attained on torpedo-destroyers in 1918. Here also may be noted the increasing use of oil-fuel and Diesel oil-engines in ocean steamers, and of petrol motors on inland waterways, as well as barges drawn by tugs at sea. In June 1920 two of the largest ocean-liners were equipped for the use of oil-fuel, for though oil was dearer than coal it presented in addition to

other recommendations the great advantages at sea of requiring much less space (little more than half that required for coal), the getting rid of stokers and the consequent reduction of the crew by about 50 per cent., and a great reduction of the time required for replenishing the fuel supply. The British Navy has also largely been converted to oil-fuel, and many liners have followed suit.

Until the Second World War the proportion of motor-ships to steamers was rapidly increasing, especially in foreign countries. In 1924 the gross tonnage of motor vessels building was stated to be 45½ per cent. of the steamer tonnage building, though in British yards it was only 35 per cent. In 1929 the tonnage of motor ships building in the world was 56 per cent. of the total vessels under construction. In 1939, motor ships represented nearly a quarter (24 per cent.) of the world's total tonnage, and sailing ships had dropped to 1.3 per cent. During the war the proportion of motor ships dropped to 20 per cent., and that of sailing ships to 1 per cent., while the proportion of steamers rose to 79 per cent. This was due to the large numbers of steamers (burning oil-fuel) built in the United States during the war. In 1951 steamships outnumbered motor ships by three to one, but new ships launched in that year were in the reverse proportion.

One consequence of the increase in the size and speed of ships has been the increase in the size and depth of the harbours belonging to the great seaports, or the establishment of outer ports for the accommodation of vessels unable to reach older ports in the neighbourhood. While such changes are brought about, it is obvious that in the competition between different countries, a great advantage belongs to those which are rich in deep and capacious natural harbours, or such as require least outlay to adapt them to the requirements of the present day.

Another less obvious but very important consequence of the same improvements has been an incalculable increase in the security of sea voyages. This has been brought about in two ways. First, the large vessels and especially the large steamers of the present time are much less liable to be wrecked by storms than the smaller vessels of past days. Second, it is the introduction of steamers that has made it possible to sweep pirates away from the sea, a service for which the world is indebted chiefly to the British Navy and mercantile marine. People who are acquainted with only present conditions cannot but be astonished on learning of the losses that formerly took place on ocean voyages. Of the 86 ships sent to the East by the English East India Company in the first 21 years of its existence (1601-21) only 36 returned with cargoes, the others having been captured, lost, or become worn out. In the ten years 1590 to 1599, 33 large carracks left India for Europe, but of these only 16 reached Lisbon. On the route from India to Japan at that time

we are told that out of nine starting on the three years' enterprise, only four might be expected to return. The average life of a carrack is given as apparently about three years.

Heavy as were these initial losses it was possible, only a few decades later, to take out a marine insurance policy from Macassar or Bantam to London at a rate of 5 per cent. This is the rate quoted in a policy, of which Lloyd's have a reproduction, dated February 1656. It is the oldest marine insurance policy in the United Kingdom, but others still older are on record elsewhere.

Ocean Trade Routes.—The route by which goods are conveyed by sea to their ultimate destination depends not only on the relative situation of the place of origin and the destination of the commodities, but on many circumstances, some connected with the nature of the commodities, some with the type of vessel used.

To understand how the nature of the commodities carried affects the route, two important considerations must be borne in mind. First, it causes expense to transfer goods from one vehicle (whether ship, railway wagon, or cart) to another. It is therefore an advantage to convey goods directly from the port which serves the district where the goods are obtained to that which serves the district in which they are ultimately sold. But, second, it is cheapest to convey goods in the largest possible vessels, provided that those vessels can be filled. This frequently makes it cheaper on the whole to incur extra costs in unloading and reloading (handling expenses), and send goods first in smaller quantities to a great port, from which they are sent in large vessels to another great port, from which again they may be sent by sea to some other port nearer their final destination.

It is bulky goods, and especially such as involve great labour in handling, like coal, timber, ores, and clays, that are most likely to be carried direct, for the quantity of such goods that may be required in a small district may be enough to fill a larger or smaller ship, and thus bring about the greatest possible saving in handling. That is why so many small British and Irish seaports import timber directly from abroad, why so many British seaports export coal sometimes in small vessels, why so many small foreign seaports receive British coal, and why small ports in Cornwall and Devon send off entire cargoes of China and other clay. Such bulky commodities as these are often useful as return or ballast cargoes, helping to reduce the freight charge in one direction by forming the whole or part of a cargo in the opposite direction. The importance of coal to British commerce in this way has often been emphasised, but salt, cement, clays, and even bricks also aid British commerce in the same way. China clay sometimes serves as a return cargo from England even to the United States. Though in value bricks form an absolutely insignificant article of export from the

United Kingdom, the weight of bricks annually exported before the First World War was probably one-fourth or one-fifth of the weight of cotton piece goods exported. It was return cargoes of wood-pulp and other timber products that favoured the temporary rise after that War of an export trade in coal from the United States to Sweden.

On the other hand, the economy of carrying in large ships explains why tea, coffee, spices, and other commodities sent from the East to the United Kingdom come almost entirely first to London, it may be in ships that are largely filled with bulky commodities. Of all these commodities much greater quantities are used in London itself than in any other centre of the country; but great quantities are also sent away by rail from London, and great quantities by sea to both British and foreign ports with which London carries on a regular trade. The daily shipping reports show how many ships come to the large ports laden with 'general cargoes,' that is, cargoes composed of many kinds of goods brought together to get the advantage of carriage in large ships. Naturally, most 'liners' which run to definite schedules, on definite routes, carry general cargoes. 'Tramps', on the other hand, tend to specialise in bulk cargoes. The goods for which sailing-vessels are still sometimes used are also those bulky goods which have been instanced as likely to make up whole cargoes.

It is obvious that the advantage of carrying in large ships will be the greater the longer the distance that goods are so carried. That is one way in which the relation of the place of origin to the destination of goods affects the route followed. It is one reason why the Eastern goods mentioned come chiefly to London in the first instance, and also the reason why the bulk of Australasian and Cape wool imported into England comes first to London, even though not a pound of it is worked up there, but all has to be sent away again either to Bradford or some other town at home or to foreign countries.

Economy of transport is a secondary consideration in the case of perishable goods, such as fresh meat, vegetables, fruit and flowers, butter and eggs; or goods of high value in proportion to their bulk, such as mails; or smaller but valuable manufactured goods. These are taken by the quickest routes in spite of the increased cost per mile, and may often be transferred from sea to land, and then again from land to sea if necessary, for the sake of speed.

The following table, based on *Lloyd's Register of Shipping*, shows the British and World totals of shipping at the end of the nineteenth century, and also before and after each of the two World Wars. The rapid decline in the number and tonnage of sailing ships, the increase in the average tonnage of steam and motor ships, and the lessening fraction which British ships form of the total, will all be noted.

Number and Gross Tonnage of Ships: British and World Totals

Shipping	1900	1913	1920	1939	1947
WORLD TOTALS					
Steam and Motor: Number	15,898	23,897	26,513	29,763	29,463
Million tons . . .	22.4	43.1	53.9	68.5	83.5
Sailing ships and non-self-propelled craft: Number .	11,712	6,617	4,971	1,423	1,170
Million tons . . .	6.5 ¹	3.9 ¹	3.4	0.9	0.8
BRITISH COMMONWEALTH					
Steam and motor: Number	7,930	10,009	9,779	8,977	8,333
Million tons . . .	12.1	19.8	20.1	21.0	21.3
Sailing ships and non-self-propelled craft: Number .	2,908	1,278	1,052	511	480
Million tons . . .	2.1 ¹	0.6 ¹	0.4	0.2	0.2

¹ Exceptionally, these figures denote net tonnage.

Later figures since the war show much the same tendency. In 1951 the returns were: World total of steamers and motor ships, 31,226 vessels of 87.2m. gross tons; British Commonwealth, 8,525 vessels of 22.2m. gross tons. In other words, in the first half of the twentieth century the British proportion of world shipping dropped from about half to a quarter. In respect of oil tankers, however, Britain is rapidly forging to the front; in 1953 it was estimated that if the then rate of progress were maintained, Britain would lead the world in tanker-carriage capacity by 1957. It is noteworthy that not only the number but the size of oil tankers is increasing. In post-war years, orders have been placed for tankers of over 30,000 tons, which is more than double the average tonnage.

Now that ocean routes depend so entirely on other factors, it is of interest to record how winds and currents formerly were of paramount importance. A vessel taking the outward route from the English Channel to New Zealand kept well to the east of the Azores so as not to have south-westerlies as head-winds and so as to get the benefit of the north-east Trades as soon as possible. After crossing the belt of calms and variable winds the vessel made for the coast of South America, at first at right angles to the south-east Trades, and afterwards, from about 21° S., getting the benefit of the winds that circulate in the 'horse latitudes' of the South Atlantic. These winds, blowing, in the west of the area referred to, from about 20° to 30° or 35° S., parallel to the coast of South America, ultimately brought the vessel to the 'roaring forties,' which carried her steadily eastwards south of the Cape of Good Hope and Tasmania to New Zealand. On the homeward voyage the same winds carried the vessel south of Cape Horn, after which the vessel stood well out to sea and sailed northward through the middle of the

Atlantic more or less obliquely to both trade-winds, and, keeping well to the west of the Azores, had a good chance of favourable winds—the prevailing south-westerlies—up the Straits of Dover.

Steamer routes are almost independent of winds and currents. Where practicable, the shortest route from port to port is adopted by steamers, and that is a route following an arc of a great circle of the earth, in other words, a circle of which the centre of the earth is the centre. Hence, where the route is from north to south or the reverse a meridian is followed, but where the route is from east to west it is only on the equator that the route lies along a parallel of latitude. As these parallels become shorter and shorter towards the poles, the shortest or great circle routes deviate more and more from the parallels as the poles are approached. The farther north an east to west route lies in the northern hemisphere the more will it curve towards the north from the parallel connecting places at the ends of the route; in the opposite hemisphere the more will it curve to the south as one nears the south pole. In the northern hemisphere, if the route is to a port lying north-east of the starting-point, the great circle route will be represented on a map drawn on Mercator's projection¹ by a curved line lying to the north-west of the straight line connecting the starting-point with the destination; if the course is from north-west to south-east, the curve will lie to the north-east of the line joining the two ends. If the course is from south-west to north-east in the southern hemisphere the curve on the map will lie to the south-east, and if from north-west to south-east it will lie to the south-west of the respective straight lines joining the points of departure and arrival.

It is only on a globe that great circle routes can be at once seen and measured. This is done by means of a flexible strip of brass called a quadrant, marked in degrees of the earth's equator according to the scale of the globe for which it is constructed. Each degree (approximately 69 miles) represents 60 nautical miles,² the unit in which ocean distances are usually stated.

To take great circle courses, however, is not always practicable. The relations of sea and land may prevent it, and so also may the character of the climate. For example, the great circle route from Cape Town to Wellington, New Zealand, goes to the south of the Antarctic Circle, and for that reason a more northerly though longer route is preferred.

Among frequented ocean routes those in which great circle sailing causes the most marked deviation from the parallels of latitude are those of the North Pacific, where very wide stretches of

¹ Mercator's is the only projection on which all directions referred to points of the compass are shown by straight lines. That is why this projection is nearly always used for marine charts.

² One nautical mile = 1.1507 statute mile.

ocean have to be crossed between the ports of North America and those of eastern Asia. Yokohama is in a more southerly latitude than San Francisco, yet a steamer sailing for Yokohama from San Francisco (under 38° N.) begins by sailing north-westwards, and describes a curve which rises to about 48° N. The route from Vancouver or Puget Sound to Yokohama passes just south of the Aleutian Islands. In the narrower waters of the North Atlantic the rise of the east-west great circle routes to the north of the parallels is not so striking, especially since Newfoundland lies in the way on any great circle from the south of Ireland to any American port north of Cape Hatteras. The trend of the coast-line south of that cape is almost on the line of a great circle passing thence to the south of Ireland, and hence it happens that the routes to all American ports between Nova Scotia and the Gulf of Mexico are almost identical from about the meridian of 60° W. (*i.e.* just west of Newfoundland) eastwards to the English Channel, and this is accordingly the busiest tract of the ocean. On the busy tracts of the transatlantic traffic, Atlantic lanes, as they are called, are prescribed for the sake of safety for east and west bound vessels respectively, varying according to the period of the year.

In some cases the route is slightly modified by the position of coaling-stations or oiling-bases. Next to the North Atlantic route, the most frequented is that through the Suez Canal, which is the meeting-place of all European and North Atlantic lines to East Africa and the Far East, and most of those to Australia and New Zealand. The part from the Straits of Gibraltar to the mouth of the Gulf of Aden is common to most of the lines following these routes. On this section the chief fuelling-stations are Gibraltar, Marseilles, Algiers, Port Said, and Aden. These fuelling-stations are also great *entrepôts*. At Gibraltar and Port Said many goods are landed by vessels entering the Mediterranean from the west or east respectively for ports of the Mediterranean or the Black Sea, at which the vessels landing the goods do not call. Aden is a place at which goods for East Africa can be dropped by steamers belonging to eastern Asiatic and Australasian lines, and goods from East Africa can be picked up by steamers of the same lines. Colombo is the fuelling-station and *entrepôt* where the lines that pass round the south of Australia diverge from the Far Eastern route. Singapore is the chief fuelling-station and *entrepôt*, and Jakarta a minor but still important port, for vessels going farther east, and at one or other of these the lines diverge that go round the north of Australia. The main route to the east continues on to Hong Kong, Shanghai, Nagasaki, and Yokohama, all great fuelling-stations and the first two great *entrepôts*, Hong Kong for southern China, and (until the Communist régime) Shanghai for the Yangtse valley and northern China. Important branch lines proceed from Singapore to the ports

of Indo-China, to North Borneo and to Manila in the Philippine Islands.

In the North Atlantic Ocean, Las Palmas, Tenerife, and Madeira are important ports of call both on the route to Cape Town and on the route to all the South American ports south of Cape St. Roque, at the eastern shoulder of the continent. St. Vincent, one of the Cape Verde Islands, is also a well-known fuelling base for ships trading with South America (see p. 718). Norfolk, on the coast of Virginia, a place of shipment of the excellent steam-coal of the Pocahontas coal-field, distant about 400 miles by rail, is frequently visited for coal by vessels returning from the Gulf of Mexico to the English Channel or the Irish Sea; and since the opening of the Panama Canal the adjacent port of Newport News has become a great coaling-place on that route. St. Thomas, one of the American Virgin Islands, and St. Lucia, one of the Windward Islands (British), are fuelling-stations in the West Indies too, visited on routes from North to South America or from Europe to Central and northern South America. St. Michael in the Azores may serve the same purpose both for steamers plying between north-western Europe and the West Indies and between North America and the Mediterranean.

In the South Atlantic the chief coaling- and oiling-stations are Cape Town and Buenos Aires. On the American seaboard of the Pacific the great fuelling-station between San Francisco and Concepcion Bay (Chile), where coal-mines exist close to the sea, is Balboa, at the entrance to the Panama Canal. Honolulu is a fuelling-base on the routes from western North America to Australia and New Zealand, and Durban is of importance on the Indian Ocean, drawing its supplies from the Natal coal-fields.

8. Aviation.—The most striking development in twentieth-century transport has been the coming of the aeroplane. The English Channel was first crossed by a heavier-than-air machine in 1910. Both aeroplanes and airships developed rapidly and became only too familiar during the First World War. The airship did not long survive. The German type, the Zeppelin, named after its designer Count Zeppelin, met with some success in civil transport, but British and American experiments were abandoned after repeated disasters, and German interest also practically ceased in 1937 when the latest Zeppelin burst into flames in New Jersey after a transatlantic flight.

On the other hand, heavier-than-air machines—both landplanes and flying boats—became a more and more important factor in modern transport. Between the two great wars the world was covered by a network of regular air services, trans-oceanic and trans-continental as well as national. British and Dutch, French, Belgian, and American companies were prominent in developing

long-distance routes. When the Second World War broke out, the principal British company, Imperial Airways, was operating regular services, mostly with flying boats, linking up with the Middle East, India, Burma, Siam, Singapore, Hong Kong, and Australia, as well as with Central, West, and South Africa. In 1940 Imperial Airways was merged with British Airways into a single Government-owned, non-profit-making corporation, known as British Overseas Airways Corporation (B.O.A.C.). This was employed in the war in maintaining lines of communication, opening new routes, and transporting military personnel, supplies, urgent dispatches, &c.; its aircraft flew over 57m. miles on war service, and carried nearly 300,000 passengers and a quarter of a million tons of cargo and mail.

The Civil Aviation Act of 1946 created two new corporations—British European Airways and British South American Airways; but in 1949 the latter was merged in B.O.A.C., which in addition to the long-distance Empire services is responsible for the routes to Canada and the United States pioneered during the war. Each corporation is Government-owned, with its own Board of Directors appointed by the Minister of Civil Aviation, who has the right to say what routes shall be flown. Only the corporations or their associates can operate scheduled services; but private companies may run charter services, and some private companies are operating scheduled air services as associates of British European Airways (B.E.A.).

International as well as national controls have been set up. Following an international conference in Chicago at the end of 1944, the Chicago Convention came into force in 1947, and by the end of that year had been ratified by 46 states. The convention provided for an International Civil Aviation Organisation (I.C.A.O.), of which there are now nearly sixty member states. Its chief task is to develop international rules to govern civil air operations in the interests of the safe and orderly development of civil flying. Within the British Commonwealth there has also been set up a Commonwealth Air Transport Council.

Companies operating from I.C.A.O. member states flew 21,000m. passenger miles in 1951, compared with 1,000m. passenger miles in 1938. The most extensive system of internal air services has been built up by the United States, favoured by its large territory, free from the artificial barriers of political frontiers. In 1952, 168,000 passengers travelled by air between the United Kingdom and the North American continent. In the fifteen years 1938–52, the number of passengers carried between the United Kingdom and the rest of the world increased nearly ten-fold—from 176,000 to 1,690,000. Nearly half the latter number were carried by aircraft registered in the United Kingdom. In 1951 about 52m. aircraft miles were flown

for revenue on the scheduled services of United Kingdom airlines, which carried 1,400,000 passengers and over 46,000 short tons of cargo, including 9,000 tons of mail and 37,000 tons of freight.

The development of air transport has been made possible by the increased speed and range of modern four-engined civil aircraft, of which the latest example is the jet-propelled air-liner. Their pressurised cabins enable them to fly at about 40,000 feet, above storms and bad weather, at speeds of four or five hundred miles per hour.

Handling.—A serious element in the cost of transport is what comes under the head of handling or the transference of the goods from one means of transport to another, or to the place where they are required by the purchaser. So greatly has the cost of transport been cheapened that in some cases the final handling is dearer than the carriage of the goods for great distances. It has been stated that a ton of coal is carried the thousand miles from Buffalo to Duluth for about the cost of shovelling it from the side-walk into the cellar. It is these handling charges, together with the cost of the delivery of goods to the customer or the collection of goods from the customer by cart or motor-wagon, that make up the terminal charges which British railways reckon and which in certain cases form a very high proportion of the total freight rate. The importance of avoiding numerous handlings of commodities in the course of transport thus becomes obvious. Before the opening of the Panama Canal it was necessary for the goods to be loaded and unloaded six times between New York and the wharves at Guayaquil on the coast of Ecuador. The general tendency of the modern developments of transport has been to reduce the number of such handlings and to introduce more economical methods. The fact that railways, on which the same wagon may be sent over thousands of miles on interconnected lines, reduce the necessity for handlings has already been implicitly referred to as one of the great advantages of this means of transport. Among modern methods of handling may be mentioned the use of large grabs or mechanical shovels capable of lifting ten tons at a time, the equipment of wharves and railway sidings with powerful cranes worked by electric motors, the use of endless bands for the horizontal transmission of commodities like grain from warehouses to ships, and of bands or chains provided with hooks or other holders for lifting. Large truckloads of coal and other commodities can be emptied through shoots into the holds of vessels, and it is possible to load a vessel of nearly 10,000 tons with iron ore in 20 minutes. On the Aire and Calder Canal trains of boats containing coal for export at Goole are made in sections of 35 tons, and each section is lifted separately and emptied at once of its contents. It is one of the advantages of grain that it can be handled like water, so that it can be sucked up

from the holds of vessels. Petroleum is transmitted for long distances from the oilfields in great pipes (pp. 267-70).

POSTS AND TELEGRAPHS. Cheap postage is another of the gains to commerce that have accrued since 1800. The penny post was introduced in the United Kingdom in 1840, and though the two World Wars have increased the nominal postage rates, they are little if any more in relation to the value of money then and now. The International Postal Union owed its foundation to a conference held at Berne in 1874. The practical use of the electric telegraph dates only from 1846 (more than twenty years later than the introduction of steam railways), but the apparatus necessary for its working is so much less costly than that of railways that the spread of the electric telegraph over the world has been even more rapid than the use of steam for locomotion. The first message through a submarine cable (between the South Foreland and the coast of France) was sent on November 13, 1851. In 1866 was laid the first permanently successful submarine cable across the Atlantic Ocean. Since the completion of the cable from Vancouver by way of Fanning, Fiji, and Norfolk Islands to New Zealand and Australia in 1902, all the oceans have their opposite sides connected by this means. Communication by wireless telegraphy on the Marconi system was established between the Lizard, in Cornwall, and the Isle of Wight, a distance of 200 miles, in January 1901, and in 1907 regular communication by the same means was established between Clifden, County Galway, Ireland, and Glace Bay, Nova Scotia. On March 1, 1920, Carnarvon in Wales and Belmar, N.J., U.S.A., were brought into like relation. Now all large and most small vessels, and likewise all aeroplanes, are provided with wireless apparatus; and wireless stations are constructed capable of communicating with all parts of the world. The telephone first became known in its present form at the Philadelphia Exhibition in 1876. Since 1914 rapid progress has been made with wireless-telephony, and by 1919 this was associated with direction-finding apparatus, making it possible for ships to ascertain their positions at sea, by taking bearings on shore wireless stations. In the following year it was so far developed that songs could be heard quite distinctly more than two thousand miles away. The first wireless conversation between London and the United States was held on January 15, 1923. Regular telephonic communication was established early in 1927. It would be difficult to exaggerate the importance of broadcasting information and news by wireless, which is now general in all the more important civilised countries. The effect is most marked in the less accessible portions of regions like Australia and Rhodesia, where individual farms may be separated by a score of miles and formerly received a newspaper perhaps once a week or once a month, but are now in instantaneous receipt of news from the

great centres. A still more recent development in wireless is the beam system whereby messages, instead of being broadcast, can be projected in a definite direction. The beam system was used between England and Canada in 1926.

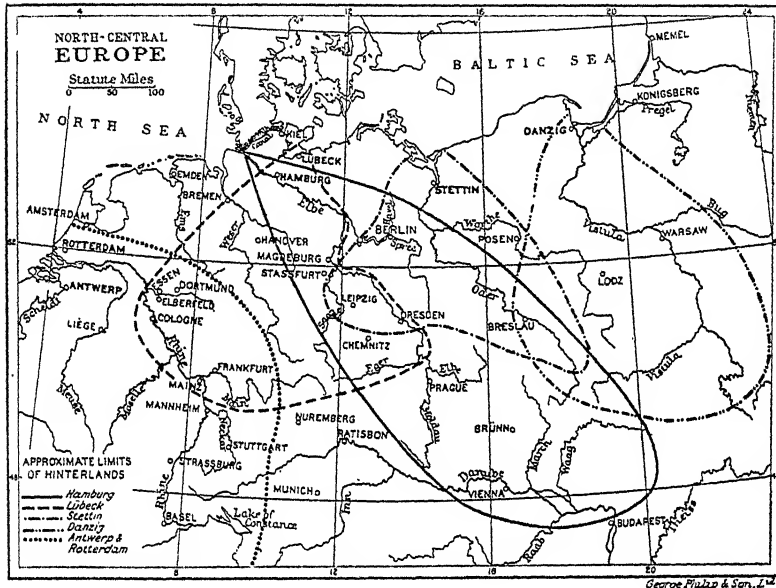
COMMERCIAL AND INDUSTRIAL TOWNS. Clearly there are certain places in which it is most convenient for the exchange of commodities on a great scale to take place. These are great business centres, commercial towns; and the situation of these towns in many cases shows that there are special conveniences for exchange that have favoured their rise and growth. All towns are more or less centres of exchange. Whatever else they may be, they are places where stores of goods in common request are kept, so that the inhabitants of the district around may be able to supply their needs, though since the Second World War individual freedom to buy has been limited by government controls.

The special advantages leading to the growth of great business centres may be of very various kinds. The mere fact that a town lies about the middle of a densely peopled district is likely to make it in many cases the most convenient place of exchange for the products of that district and the articles brought from more distant parts to be used within it. Hither are brought in large quantity the various products from the parts in which they most abound, and hence they are sent out again in smaller quantities, along with quantities of other kinds of goods, to the parts in which they are required.

So, too, towns that are situated where the form of the surface in the country round about causes a number of roads to converge are likely to grow up into more or less important business centres. If a town is situated in a comparatively open expanse enclosed by hilly country through which valleys have allowed roads to be made in different directions, it will naturally be the centre of business for the districts to which these roads lead, and its importance as such will probably be in proportion to the productiveness of the surrounding regions. Since roads from a level country will naturally converge towards passes which lead over hills or mountains, towns are apt to arise, in such situations, at the meeting of hill and plain. In like manner, many towns have grown up at spots where for any reason there was a convenient crossing-place on a river by ford or bridge, and many others exist at the confluence of navigable rivers, at marked bends on rivers, or where the superficial configuration leads to the convergence of numerous railways, as at Chicago, Toronto, Winnipeg, or Atlanta.

Business towns likewise spring up in many situations in which the circumstances necessitate a change in the mode of carriage. Of this class of towns, seaports are the most numerous examples. Where goods have to be transferred from any mode of land carriage

to ships, there must necessarily be a town to accommodate those engaged in this transfer. Hence it is that so many of the large towns of the world are seaports, the relative importance of which depends chiefly on the productiveness and accessibility of the regions served by them, or, in a single word, of their hinterlands, and the facilities which they afford to shipping.



HINTERLANDS.

The term hinterland is one that may be used with reference both to a single seaport and to a seaboard on which there are several seaports, and may be defined as the land which lies behind a seaport or a seaboard and supplies the bulk of the exports, and in which are distributed the bulk of the imports of that seaport or seaboard, either generally or in relation to certain uses. The necessity for the first clause in this definition arises from the way in which the outline of the land sometimes determines the port with which an inland region communicates in its relations with different parts of the world. Thus the West Riding of Yorkshire may be included in the hinterland of Liverpool for Irish and even a considerable amount of transatlantic trade, but for North Sea trade it obviously belongs to the hinterland of Hull, Goole, or Grimsby. The Elbe basin forms the chief part of the hinterland of Hamburg in relation to all North Sea and oceanic traffic, but is included in that of Lübeck in relation to the Baltic. Toulouse belongs to the hinterland of Bordeaux for

all traffic except that of the Mediterranean, for which it would naturally make use of Sète or even of Marseilles.

The word, which is of German origin, was introduced into English about 1884, in connection with the discussions that arose on the occupation of parts of the West African coast. It came at once into general use from the fact of its meeting an obvious requirement. A later extension of hinterland has been to include the land tributary to an urban centre, independently of whether that urban centre is a port.

From some of the examples just given, it will be observed that the hinterlands of different ports may overlap even in relation to the same seas. This arises from the influence on a seaport of shipping facilities and facilities for communication with the hinterland. The hinterlands of Hull and Goole to a large extent coincide, but where the economy of transport effected by the use of large ships is the chief consideration, Hull will be preferred on account of the superior facilities for shipping there afforded, but where smaller vessels serve the requirements of a particular trade, Goole may and probably will have the preference in consequence of being nearer the hinterland. The trade of Quebec may encroach on the hinterland of Montreal, but its distance from that hinterland will prevent it from doing so except in the case of such traffic as is greatly promoted by rapidity of transit, such as passenger traffic and traffic in the more perishable or more valuable and less bulky commodities. Trade rivalries and the nature of the internal means of communication also affect the competition of ports in the same hinterland, as in the case of Grimsby and Hull. Lastly, it should be pointed out on this head that the extent and importance of a hinterland may be greatly increased by improvements in the means of internal communication, by improvements in the port itself, and particularly by adjustment of inland freight rates.

The frequent necessity for change in the mode of carriage also helps to explain why many towns have grown up at the foot of pass-roads, and the same circumstance likewise explains the precise situation of many towns situated on rivers. Many such towns are situated, or were founded, at the highest point to which rivers could be navigated, or could be ascended by vessels of a certain size; many, where a rapid hinders, or a fall prevents, further navigation. To one or other such points goods are, or were formerly, conveyed by boats, and a town sprang up where they were landed. Other towns on navigable rivers are situated where there is a sudden change in the direction of the stream, because at that point goods had to be landed which were not intended to follow the new direction taken by the river. Even where the navigation of rivers has ceased to be important, the study of navigable rivers must have a permanent place in economic geography on account of their having

determined the original sites of towns, where subsequent growth is due to other causes, in a large measure to the provision of other means of communication. It has been said by Moulton that the location of every city of importance in the eastern part of the United States, with the single exception of Indianapolis, was determined by the possibilities of water transport.

Since the development of machinery, many large towns have sprung up where there is abundance of coal, or coal and iron, or oil, or extensive water-power, the mainsprings of modern industry; and all such towns are more or less business centres. Yet they are often far from being business centres in proportion to the extent of their production. Where numerous manufacturing towns exist on a great coal-field the business of exchange may be centred in one of them that is not pre-eminently itself a manufacturing town. The great magnitude of the business of exchange in such a region is adverse to the carrying on of manufactures in its business centre, for the cost of land, owing to the requirements of merchants and others for offices, &c., becomes so great that it is too expensive to erect large factories. Hence it is that Manchester, in which, according to the estimate of a local manufacturer, is sold probably three-fourths of the cotton-yarn spun, and even a larger proportion of the cotton cloth woven in the United Kingdom, is less of a manufacturing town than many of the smaller towns round about.

What has just been said makes it clear that a variety of influences must be kept in mind as affecting the localisation of industry. These work in combination, in some cases one or two of them having the chief efficacy, in others another group, and unfortunately neither individually nor in association is it possible to measure them. The main localising influences may be considered under the heads of the market, the labour supply, the cost of land, the situation of raw material, the nature and situation of the sources of power, the value of the commodities produced in relation to the cost of their production, and finally the supply of capital.

In connection with influences coming under any of the heads enumerated, two general facts are worthy of note. First, the psychological action of the sense of opportunity as a stimulus to exertion can hardly be exaggerated. 'What is wanted,' says Bertrand Russell, 'in order to keep men full of vitality is opportunity, not only security.' Marshall remarked 'that a man's energies are at their best when he is emerging from poverty and distress into the command of great opportunities'. It is the great function of capital to create opportunities, but economic development is likely to be most rapid where opportunities are most obvious and easiest to turn to account. The second general fact referred to is that great economies can always be effected where it is profitable to work on

a large scale, though that does not imply that there are no economies peculiar to small-scale production.

It is obvious that the profitableness of large-scale operations must depend on the adequacy of the market, which again is governed by various conditions as (1) the number of people where the industry is carried on; (2) the purchasing power of the people, a great contrast in this respect being presented by China, India, and Africa as compared with Canada, the United States, and other countries in which the purchasing power is enhanced by the diffusion of education, and probably still more by the extent of the undeveloped resources; (3) the nature of the commodity for which a market is sought—cheap goods for peoples of small purchasing power, more valuable commodities for regions in which individual wealth is greater; (4) facilities for transport as enlarging the range of the market. Here it may be noted that the aim of a protective or preferential tariff is to preserve a large home market for the favoured industry or industries. Where the protection afforded is absolute, the whole country embraced by the tariff forms a local market for the protected industry.

As to labour, reference should be made to what has already been said (pp. 64–78), but we may note further that much depends on the opportunity for organising labour, and that while abundant labour necessarily involves the presence of a more or less important market, the degree of its importance must vary in proportion to the purchasing power of the labourers. The cost of land is another fact intimately related to the value of the market as influenced by populousness and purchasing power. Further, a dense population is a great advantage in all matters involving mutual aid. This advantage is usually paid for when a high price is given for land. The consideration as to the value of commodities is intimately connected with that as to labour organisation. Industries concerned with the manufacture of very valuable products of highly skilled labour, such as calculating machines, typewriters, electrical apparatus, &c., may be carried on with advantage in any of a thousand places in a fairly populous region furnishing a large part of the demand, but in such a region the spots affording the greatest facility for distribution will naturally be selected. The supply of capital is another item more or less related to the number of the population, but far from being directly proportioned to its density.

The influence of coal in promoting the growth of towns has been both direct and indirect. If the mines are large and numerous in one locality, the population of miners with their dependants and the shop-keepers required to supply their wants will form a considerable town, but this population is generally increased more or less by the industries to which the presence of the coal gives rise. It is evident, however, from a consideration of the facts of industrial distribution

in different parts of the world, that the influence of coal in attracting industries to the coal-fields varies in different circumstances. The great coal-fields of England and Scotland, of Germany, Belgium, and the north of France have all become seats of varied industry, but in the United States, the greatest coal-producing country in the world, most of the manufacturing towns lie hundreds of miles away from the coal-mines, even where the power which they use is now mainly derived from coal, and some of the leading textile manufacturing towns of both Germany and France are also at a great distance from the mines.

To understand the very powerful influence that coal has had in attracting manufacturers to the place of its production, one must bear in mind one broad fact, that raw materials tend to attach industries to their place of production in inverse proportion to the amount of the raw material that enters into the final product. A raw material which enters wholly into the manufactured product without leaving any waste can in itself, that is, apart from other favouring circumstances, have little effect in planting an industry where the raw material is found or produced, except where the intrinsic value of a heavy or bulky raw material is extremely small. This is true not only of original raw material but also of such half-manufactured raw materials as are not more bulky and expensive to transport than the materials from which they are made. It is true, for example, of pig-iron and steel blooms and billets, which can be so freely sent great distances both by land and sea to feed the higher branches of the iron industry carried on where other conditions may be more favourable. Conversely, the presence of a raw material of which a large proportion is waste has a tendency to attract the industry making use of it to the material, or at least those stages of the industry which are necessary to get rid of the great bulk of the waste. Hence it is that a large variety of timber products are made by local sawmills in the neighbourhood of the forests from which the timber is obtained, that pulp-wood is locally made into wood-pulp and even paper, tanning and dyeing extracts made locally from wood and bark, sugar generally locally manufactured at least to the stage of 'raw' sugar, coconut kernels dried into copra, cacao beans extracted and dried, metallic ores partially refined on the spot into mattes, and so on. Now when coal is used as fuel, and that is its principal use, no part of the coal enters into the finished product, so that, if it has to be transported, the cost of carriage is an extra which would be wholly saved if the industry for which it is dispatched could be carried on with advantage where the coal is produced, an extra which is all the more serious on account of the great bulk of coal in proportion to its value. True, the tendency of coal to localise industries from this cause may be counteracted by other localising influences, and has been greatly

lessened in recent years by the *indirect* use of the coal as carbo-electricity. As a striking illustration of the way in which some of the advantages just mentioned may combine to localise an industry away from the coal even where coal is used in large amount, one may take brick-making as carried on on a very large scale at Peterborough, England. The raw materials are clay, water, and coal. Neither the water nor the coal enters into the final product, but the clay does so wholly, yet the industry is carried on where the clay, not the coal, is found. But brick-fields cover a great extent of ground, and it would probably be difficult to find land as cheap on the coal-fields as that where the clay lies, and, what is more important, to carry the clay to any coal-field would be carrying it farther away from the great market for the bricks, namely London.

On p. 258 estimates are given of the percentage use of coal for different purposes in the United Kingdom and the United States between the two World Wars, and in Germany before the First World War. The large proportion consumed in the iron and other metal industries is striking. The heaviest consumption is in the blast-furnace and in the making of mild steel and ingot iron; hence it is natural that these industries should be specially attracted to the coal-fields. It is these industries that form the chief exception to the general rule in the United States that the manufacturing towns are not on the coal-fields. Even in the smelting of iron it sometimes happens that the ore is carried to the coal. In other cases so little of the ore enters into the raw iron that there is less waste of haulage in bringing the coal to the ore, especially if the limestone, another material required in smelting as a flux, no part of which enters into the product, is more conveniently accessible from the ore deposits. In yet other cases the advantage of using the means of transport in both directions, instead of having in one direction empty railway wagons or ships in ballast, leads to a reciprocal trade with a smelting industry at both ends. Sometimes again all three raw materials are collected at some convenient point in relation to the transport of the materials, the labour supply, and the means of distribution of the product, as at Middlesbrough in England, and Buffalo, Cleveland, South Chicago, Gary, and Duluth on the Great Lakes of America.

Among finished articles using steel without waste of the raw material, rails and structural steel in particular may be mentioned as manufactured very extensively where the steel is produced, but this is because these are industries that benefit largely by large-scale organisation as well as through the economy arising from using the steel before it has lost the heat given to it in the process of manufacture. Still, the increase in bulk in structural steel adds so much to its cost of transport that it is usually found advantageous to carry on this industry near tide-water or even near a very large

market in spite of the local lack of both coal and iron. The bulkier the final product and the more skilled labour counts for in its production, the less powerful is coal as a factor in determining the seat of an industry, and in such cases the tendency is for the industry to be carried on in the vicinity of the principal market or markets. It is for these reasons that the manufacture of agricultural implements is largely carried on in agricultural districts, as in the east of England and the north-west of America. The large areas required for the plant in these industries, and indeed for many modern industrial plants with their 'horizontal' layout, are another reason for their deserting the more crowded industrial centres. In the textile industries, if other conditions are equal, the advantages of local coal (or water-power) may be decisive provided the local supplies of soft water are good, but there are abundant examples to show that these industries also are easily deflected from the source of power.

Where the advantage of local coal is the main cause or one of the main causes of establishing industries employing a good deal of labour, other industries to which cheap coal is not of such vital importance may be set up in the same places on account of the labour supply thus afforded. The contiguity of various industries favours all of them in so far as it facilitates the shifting of the workers from industry to industry, or at least from one branch of an industry to another, according to the vicissitudes of trade. Further, light industries using female labour often grow up side by side with heavy industries using male labour, or in areas where the male labour is otherwise employed, *e.g.* in ports.

Central stations for the generation of electric power by coal or central gasworks for the manufacture of gas from coal have become very numerous in recent years, and are now greatly encouraging the dispersal of industries.

All the circumstances mentioned above are manifestly subject to change, and so contribute to fluctuations in industry and commerce. Markets may become more valuable through increase in population or the development of resources previously unused, by improvement in the means of transport, and in other ways. The supply of labour, both skilled and unskilled, may be changed by migration, that of skilled labour locally increased by education and experience. Capital, where scanty and dear in proportion to the undeveloped resources, may be cheapened by local accumulation, by increase in security, or by increasing knowledge in the investing countries of the security actually afforded. In the case of primary raw produce an important distinction must be made between those products which are completely or economically exhaustible, such as minerals and natural fertilisers worked like minerals, and those which can be reproduced indefinitely; and again, among the latter,

between those which can be reproduced annually or even several times in a season (such as clover, alfalfa, &c.), and those which can be reproduced only at intervals of years, such as timber and pulp-wood trees.

As already indicated, the prosperity and relative importance of towns at the present day are in many instances due to other circumstances than those which determined their original situation and favoured their early growth. The very fact that a town exists and has attained a moderate size makes it a more or less convenient centre of exchange, and hence may make it worth while to increase its facilities for this purpose. Growing up, in the first place, it may be, at a point to which roads naturally converged, it became of sufficient importance to have new roads made from it. So in modern times railways have been made to towns because the towns already existed; and now the prosperity of the town is determined by the railways. In many cases the introduction of railways has favoured some towns at the expense of others, which may before their introduction have had a more favourable site. But the importance of such natural advantages as have been indicated in the foregoing pages is still to be seen in situations where towns grow up in new countries. In the older countries what may be called geographical inertia (not leading to change) or geographical momentum are significant.

The great business centres of the present day in populous countries with modern means of transport are normally places in which the staple commodities can be procured at any time in any quantity likely to be wanted; though since the Second World War government restrictions and controls have become a limiting factor in many cases. In less populous and less commercially developed countries, it is still the custom, as it once was more generally, to hold periodical fairs at certain places at stated times. At these fairs merchants congregate from a greater or less area, in proportion to the importance of the transactions carried on, and the local dealers supply themselves with all they are likely to want till the next fair. The places chosen for fairs are naturally, in many cases, such as present peculiar facilities for communication in several directions. In eastern countries, great fairs are often at the same time great religious festivals, as at Mecca in Arabia, Allahabad and Hardwar in India, and the place of the fair is determined chiefly on religious grounds.

All Mohammedans, poor or rich, are enjoined by their religion to proceed at least once in their lives to the sacred city of Mecca. The poor live by the way on alms, but most of those who are better off take with them all their possessions, thinking them well spent in accomplishing this object of devotion, or, if they are rich enough to have goods to spare at the end of their journey, hoping to in-

crease their wealth by trade, which they can do all the more easily because thousands of pilgrims are compelled to part with all they have left for whatever they can get. In certain cases these pilgrimages have been of use in introducing the products of one region into another. The Arabian coffee-plant, for example, is said to have been introduced into southern India by a pilgrim on his return home.

The advantages of fairs held periodically are by no means without significance in the modern world. An excellent example of the resuscitation of fairs is seen in the British Industries Fair, held annually in London and Birmingham, and open to trade buyers only during the normal hours of business.

COMMERCIAL COUNTRIES. The facilities for exchange that have given to certain towns a high degree of importance as business centres have during certain periods secured to particular countries a peculiarly commanding position in the commerce of the world. In the Middle Ages the most valuable commerce was that between eastern Asia and Europe; and as long as this was carried on through western Asia or by the Red Sea, Italy had peculiar advantages for securing the bulk of that commerce. The ships of Genoa and Venice visited all the coasts of the Mediterranean, the Black Sea, and western Europe, and the commerce with the heart of Europe was carried on by way of the Alpine passes. It is owing to the former pre-eminence of the Italian cities in this trade that so many places in the east of the Mediterranean have Italian names or names of an Italian form. The name *Levant* for the east of the Mediterranean is itself a name of Italian origin; the names *Negroponte*, *Montenegro*, and others are Italian; and *Aleppo* is an Italian form of the local name of that town.

Before the close of the fifteenth century some of the land routes for commerce with the East had already been closed through political events, but the discovery of the sea-way to India round the Cape of Good Hope gave the most serious blow to the eastern trade of the Italian cities. In 1504, a contemporary chronicler records, the galleys of Alexandria returned in February to Venice empty—a thing that had never been seen before, and in March those from Beirut were found to be empty likewise. The chronicle is continued till 1512, and speaks constantly of the scarcity of spices in Venice; in 1506 it is specially noted that at a fair in that year the Germans had bought very little. As early as 1504 a project for cutting a sea-canal through the Isthmus of Suez, with the view of regaining for Venice its lost supremacy, began to be urged. The trade with Germany continued during the whole of the century, and also the following century; but it was in a state of decline. At first eastern commodities were to be purchased at Lisbon, but soon the towns of Flanders and Holland (*Antwerp* and *Rotterdam*)

secured the bulk of the commerce with central Europe. As commerce has grown more world-wide, as the New World has become more populous and more wealthy, the advantage of situation has come to belong to the British Isles, which are nearly in the middle of the land-surface of the globe. This is far from being the sole advantage which Great Britain possesses as a mercantile country, and the nature of its advantages will be more particularly considered elsewhere (pp. 326 *et. seq.*).

LANGUAGE, &c. The language of commerce, when carried on between peoples speaking different tongues, is generally of a very mongrel character. In the days when Italian trade was predominant in the Levant, there arose in all the coasts of that region a trade language, the basis of which was a corrupt Italian, but which borrowed numerous words from the local dialects in different places. This language is known as the *lingua franca*, and is still spoken in many of the eastern Mediterranean towns. The dominant languages of commerce at the present day have all begotten corrupt forms of speech of a similar nature. In Chinese ports a mongrel kind of English is spoken, which is known as 'pidgin' English (*pidgin* being the Chinese pronunciation or corruption of *business*). A 'negro English' is spoken in many places on the west coast of Africa, another kind of corrupt English in New Guinea. Arabic is spoken with many corruptions, and much admixture of words derived from other languages throughout the Mohammedan world. Swahili, the language of the mixed Arab and Bantu race in tropical East Africa known as the Swahili, is the common medium of intercourse throughout that region, and even among many Congo tribes, and the Hausa language acts as a sort of *lingua franca* over practically all Africa north of the equator and west of the Nile valley. Hindustani, a dialect of Hindi, has become the *lingua franca* all over northern India and has been carried by Indian seamen (lascars) and Indian traders to most of the great ports of the world, and the Malay language predominates in the Eastern or Malay Archipelago. Spanish is the prevailing language of the New World south of the United States, except in Guiana and Brazil. The wide predominance of Spanish commerce in former days is still seen in the survival of a few Spanish words in more than one *lingua franca*, of which English or some other language forms the basis. More and more, however, with the increase of telegraphy, telephony, and rapid communication, the commercial languages are becoming restricted to those of Europe—English, French, German, Spanish, Italian, and Russian.

INSTRUMENTS OF EXCHANGE. Another indispensable means of carrying on trade on a great scale is the existence of some common measure of value. Such a common measure, when it is used for no other purpose, or when chiefly used for that purpose, is

money. In intercourse with uncivilised peoples it is still necessary in at least some cases to resort to barter—that is, to the exchange of articles that are intended for other purposes than media of exchange. In the old trapping days of the Hudson's Bay Company, at the time when beaver-skins were of great value in Europe, a trade gun would buy from the Indians as many beaver-skins as could be piled up on each side of it. Coloured beads, which were worn as ornaments, were another very common means of purchase. In the interior of Africa services and native produce are even now sometimes paid for in kind; in the absence of trading stores a bag of 'mealie meal' (maize flour) is a recognised unit in payment for labour. But the use of regular currencies is now very widespread, and most native races have developed a sense of the European standard of values.

But even where trade is carried on by barter the need for some common measure of value soon comes to be felt, and hence some article of exchange in very general use is adopted as a standard with which the other articles of barter are compared. Thus, in western Africa a piece of cotton-cloth of about six yards in length came to be very generally recognised as a unit of value, and as one yard forms a smaller unit, a piece of cloth six yards long is still usually made up into six folds.

The articles that have been and in some cases still are used as money in different parts of the world are very various. Of all non-metallic kinds of money, that which came into most extensive use was the cowrie-shell (*Cypræa moneta*), which was very largely used in the trade of Africa and southern Asia, as well as in the islands of the Pacific. The home of this shell is the Pacific and Indian Oceans, and shiploads of it were conveyed from the Maldive Islands, the Philippines, and other island groups to the European ports carrying on trade with the African tribes among which it circulated. In Uganda, at the end of last century, a single cowrie-shell worth 1-800th of a rupee had definite purchasing value, and when a Hut Tax of Rs. 3 was imposed in 1900, cowries came pouring in by the million. At the other extreme, the island of Yap, in the western Carolines, not only had shell money but hoarded communal wealth in the form of large millstones of aragonite (a form of carbonate of lime quarried in the Pelew Islands 200 miles away) measuring up to 18 feet in circumference and weighing up to 3 tons. In ancient Mexico the currency of the country consisted of 'bits of tin stamped with a character like a T; bags of cacao, the value of which was regulated by their size; and, lastly, quills filled with gold-dust'. Even on the Atlantic coast of the United States it was stated, as recently as 1888, that oysters were used as money in a certain district on Chesapeake Bay, an oyster forming the regular subscription of a daily newspaper.

Of all forms of money the most convenient, and those in most general use, are paper notes and metallic coins, and the printing of notes and coining of metals are in all countries a prerogative of the government. Coins are seldom made of any one metal. For convenience of manufacture various alloys are used, but all coins on their issue from the mint ought to possess a definite weight of the principal metal in their composition, whether gold, silver, or copper. The proportion of that metal to the total weight of the coin is called the fineness of the coin.

The value of a coin does not always depend solely on the amount of fine metal which the coin contains. Coined money is of two sorts, which are called respectively standard money and token money. In the former the fine metal used is the standard metal of the country—that is, the metal which ultimately fixes the value of all the coins used in the country. In order that any particular metal should form a perfect standard, the metal in question must be received for coinage in unlimited quantities by the state, the coins made with that metal must be made unlimited legal tender; that is to say, payment in such coins must be declared to be a valid discharge of any debt, however large, whilst there must also be freedom to melt and export the coins. If gold, therefore, is the standard metal of any country, any mining company can take as much gold as it raises to the mint of that country, and receive in exchange the same quantity of gold in the form of coin, with a small reduction, it may be, for the expense of coining. In these circumstances, it is obvious that the value of the gold is represented exactly by the value of the equivalent coin, and the value of the coin will rise and fall with the value of the gold.

It is otherwise, however, with token money. The value of the fine metal in such money is fixed by law in relation to the value of the standard metal. The non-standard metal is not received in unlimited quantity for coinage at the mint; and when the money made with it is merely a token money, it is not made legal tender except in payment of small sums. In the United Kingdom the standard money (sovereigns and half-sovereigns) was withdrawn from circulation during the First World War. Gold remained the standard until abandoned in September 1931, but the greater part of the circulation since the First World War has consisted of full-legal tender paper notes; and this is true of most countries. Where silver or copper coins are mere token money, they represent in face value a greater value, and sometimes a much greater value, than that of the fine metal contained in them. If otherwise there would be a natural tendency to melt the coins for the sake of the metal they contained.

Everybody is familiar with the fact of variations in the price of commodities. Now in gold-standard countries there are not only

variations in the value of these commodities in relation to gold, but also in that of gold in relation to them. In countries not on the gold standard, such as Britain, it is, of course, natural to refer to values in 'sterling' or in the case of the United States to U.S. dollars. Where there has been a greater or smaller change in one direction (whether a rise or fall) of all or nearly all commodities, it will be right to say absolutely that, whatever the cause may have been, there has been a change in the value of gold. When distant dates are compared (intervals of a generation, or one, two, or three centuries, for example) it is nearly always found that such a change in value has occurred. This is not the place to elucidate the nature and cause of such changes, but it is important to bear in mind that, whereas statistics of commerce in which values are expressed in the same standard coin afford a more or less satisfactory means of comparing different countries at the same period, they are far from being so satisfactory as a means of comparing the commerce of the same country at widely different dates. The sum of £5m. considered in respect of 'purchasing power' was very different in (say) 1880 from the same sum in 1920, and the difference was still greater after the Second World War. These considerations make it extremely difficult to compare pre-war and post-war trade and resort is often had to the *weights* of the chief commodities.

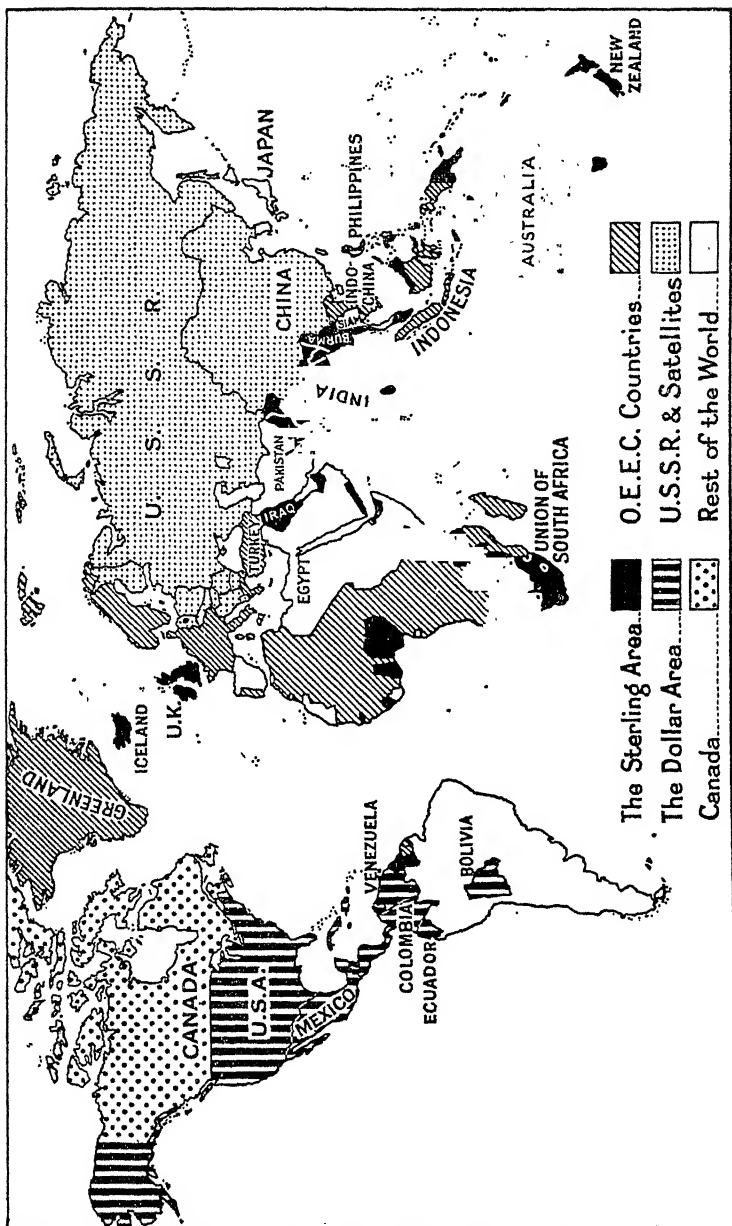
Money in the form of coin is used only to a very limited extent in the discharge of pecuniary obligations, whether the parties belong to the same country or to different countries. The equivalent of coin in paper is the more usual mode of payment in the case of all but small transactions, and the proportion of debts discharged in this way is generally greater in proportion to the commercial development of the country in which the transactions occur.

Whatever the form of a paper circulation may be, its efficiency as a perfect substitute for coins depends on the fact of the holder of the paper being able to obtain the equivalent in coin whenever he wishes it. In payments made within the bounds of any particular country, the most usual substitutes for coin are bank-notes and cheques. Bank-notes are promises of a bank to pay; in England only the Bank of England can issue them. Cheques are orders to a bank to pay, made by persons who have money to their credit in the banks on which the orders are made. In large transactions, payment is very often made in the form of a bill of exchange, which is a demand upon a merchant to pay at a certain date a certain sum of money for goods which he has received. Such a demand is usually presented to the merchant on whom it is drawn for his acceptance, which he signifies by his signature, and when accepted by him it becomes a valid claim against him. The details in connection with the use of bills of exchange are far too numerous to be mentioned here. It is usually in connection with such bills that

the rate of exchange between different countries is spoken of. Bills of exchange are very generally made use of in settling debts between persons belonging to different countries, because they are a cheaper method of doing so than using coins for the purpose. If gold coin or bullion were sent, the cost of its carriage would have to be paid for; it would have to be insured, and other expenses would have to be incurred. It is obviously, therefore, a cheaper method for a merchant who has a claim against him in another country to send over an equivalent claim which somebody else may have on some one in that country. He buys that claim in the form of a bill of exchange, and the price which he has to pay for it varies according to circumstances. It varies according to the credit of the person or persons who accept responsibility for the bill, according to the date at which it becomes due (being obviously of less value if payable three months after date than if payable at sight); and even with the 'best' bills—that is, those secured in the most satisfactory way by the credit of the responsible parties—it varies according to the state of trade between different countries. When the bills procurable in one country, A, payable by importers in another country, B, are greater in value than those available in B and payable by importers in A (which is equivalent to saying, when A has exported to B a greater value than B to A), then A will have more bills than are necessary to meet the claims of B. Those holding such bills in A will, accordingly, be unable to get as good a price for bills as those in B who hold bills on A. They will be glad to sell them at as good a price as they can get, for they run the risk of being unable to find a customer for them, and hence being obliged to bear the expense of having coin sent over to them in discharge of their claims. Holders of bills in B which are payable in A, on the other hand, will find that there is a great demand for their bills on the part of persons who fear lest they may have to bear the expense of sending coin over in discharge of their debts, and the holders will ask as high a price as they can exact.

Enough has been said to make three facts of importance manifest; first, that the rate of exchange for the equivalents of the same coins may be different in one country from what it is in the other (which, in fact, it usually is); second, that there may be differences in the rate of exchange between countries having the same standard coin (as England and Australia); and third, that in normal circumstances the extreme limit of fluctuation in the rate of exchange for bills payable at sight, above or below the exact equivalent of the coinage of the one country in the coinage of the other, must be the cost of transmitting the coin itself.

Much that is said in the preceding paragraphs is no longer applicable all over the world because of varying degrees of currency control adopted by most countries, especially during and since the



THE CURRENCY AREAS OF THE WORLD IN 1953.

O.E.E.C. = Organization for European Economic Co-operation.

Second World War. A map has been included to show the chief currency regions of which a good example is the 'Sterling Area'. Within this area sterling—i.e. the British pound—is freely exchangeable and may be freely remitted from one country to another. Government permission, on the other hand, is needed before sterling can be remitted outside the sterling area. For private use, such as pleasure journeys from Britain to the continent of Europe, only small amounts are permitted; for business purposes the Government Agent, such as the Foreign Exchange Control of the Bank of England, decides whether a request for foreign currency is justified or not.

COMMODITIES

I. COMMODITIES DEPENDENT DIRECTLY OR INDIRECTLY ON CLIMATE

A. Products of the Temperate Zone

WHEAT. This, the most valuable of all the grains of temperate climates, has been cultivated from the remotest antiquity. The remains discovered at the lake-dwellings of Switzerland belonging to the Neolithic period, or New Stone Age, show that at that time, long before the beginning of written history, as many as five different varieties of wheat were already in cultivation. The crop early acquired an important place as an object of agriculture in all parts of the temperate zone in the Old World where the climate was favourable to it, and gradually extended its domain at the expense of other crops which in certain regions were more easily grown, but which yielded a less valuable grain. Though in the New World wheat, like most other grain crops, was unknown in the time of Columbus, its cultivation has since spread there to such an extent that Europe now makes up by supplies obtained thence the greater part of her own deficiency in this cereal. In Australia also this grain is now in general cultivation, and in fact there are few parts of the world with a suitable climate and a sufficient population where wheat is still unknown.

A crop so valuable, so widespread, and so long in cultivation could not fail to exhibit a great number of **varieties** and to show the result of past care in improved quality. The varieties of wheat cultivated at the present day yield larger grains than those of the ancient lake-dwellings. The number of the varieties now grown is probably in a literal sense countless, new varieties constantly being produced. Very often these varieties, as in the case of other cultivated plants, manifest strong local preferences, and do not flourish except in particular regions. The seeds of English wheat fail in India; and, on the other hand, the wheat-growing region of northern India, in which the crop has to ripen during the cool season before the advent of the scorching heats of summer, has developed varieties of wheat which ripen in a shorter period than those of colder climates, but which pine and dwindle when an attempt is made to grow them in England. It is still more important that varieties have been de-

veloped which ripen in the short summers of the Canadian north-west and Siberia. Not only does the behaviour of the crop under cultivation thus vary in different regions, but there is also a difference in the composition of the grain derived from crops grown in different parts of the world.

The **best soil** for the cultivation of wheat is one in which clay predominates, but which is not too stiff and heavy. As regards **climate**, wheat demands a higher temperature than any of the ordinary cereals of the temperate zone, except maize, so that its northern limit lies to the south of those of oats, rye, and barley. Further details of soil and climate best adapted for wheat are given in the following extracts from the report in the Tenth Census of the United States.

‘As regards soils, we may say in a general way that light clays and heavy loams are the best for wheat. On the one hand, very heavy clays often produce good crops, both as to yield and as to quality; and, on the other hand, the lighter soils may yield a good quality—it is simply smaller in quantity. The best crops, however, come from moderately stiff soils, but any fertile soil will produce good wheat if all the other conditions are favourable. Good wheat-lands agree in this: that they are sufficiently rolling for natural drainage, are at the same time level enough to admit of the use of field machinery, and are easily tilled, admitting the use of light field implements in their tillage, and thus allowing of a very large production of grain in proportion to the amount of human labour employed.’ It was because of the cost of ploughing clay land (requiring a three-horse plough in place of the usual one- or two-horse) that heavy soils went out of cultivation in England before the use of tractors again altered the position.

‘For commercial as well as agricultural success, climate is an all-controlling condition. Wheat is normally a winter annual. For a good crop the seed must germinate and the young plant grow during the cool and moist part of the year, which season determines the ultimate density of growth on the ground, and consequently mostly determines the yield. It ripens in the warmer and drier parts of the year, which season more largely determines the quality, plumpness, and colour of the grain. In climates with winters so cold that all vegetable growth is suspended, we have two distinct classes of varieties, known respectively as spring and winter wheats [*i.e.* wheats sown in spring and in winter]. . . . In California, and in similar climates, as in Egypt, this distinction does not exist in respect to their cultivation, although the varieties partake more of the character of winter wheats than of spring, both in their mode of growth and in the character of the flour made from them. But in all climates, and whatever variety may be grown, the crop must be sown and have its early growth in a cool part of the year. Wheat branches [“tillers”] only at the ground, and produces no more heads than stalks, and it

only sends out these branches early in its growth or during cool weather, and when the growth is comparatively slow. A cool, prolonged, and rather wet spring is therefore best for the ultimate yield of the crop, a warm, rather dry, rapidly growing, and early spring diminishes the yield; there are then fewer stalks, and the heads are fewer.' It is thus clear why the great mid-continent grasslands of the world (see pp. 42-3), with their spring rains, favour wheat cultivation.

'In a country of cold winters, for good crops it is better that the ground be continuously covered with snow. Bare ground, freezing and thawing, now exposed to cold and dry winds, and now to warm sunshine, is exceedingly destructive to wheat. It "winter-kills" in two ways: it may be frozen to death by cold, dry winds, or, as is more often the case, particularly in soils rich in vegetable matter, it "heaves out", and by the alternate freezing and thawing of the surface soil the roots are lifted out of the soil and the young plant perishes.' A little before the time of harvest, some moisture is required to 'swell the grain.'

'The quality of the grain is largely determined by the climate, a hot, dry, and sunny harvest-time being best for wheat of the first grade. The wheat of sunny climates—those of California, Egypt, Northern Africa, and similar countries—has always ranked high for quality. The particularly bright character of American grain depends upon the climate rather than upon the soil. The sunny climate of the whole United States south and west of New England is favourable for this, and from the time of the first settlement of the colonies the bright colour of American grain as compared with that of Northern Europe, particularly that of Great Britain, has been remarked.'

The following table, based on figures published by F.A.O. (Food and Agriculture Organisation of the United Nations), gives examples of the average yields of wheat in bushels per acre in different countries in 1950. A bushel weighs 60 lb.

Countries.	Bushels.	Countries.	Bushels.	Countries.	Bushels.
Denmark . . .	52	Italy . . .	24	United States .	17
Holland . . .	48	Russia ¹ . . .	14	Canada . . .	17
Belgium . . .	47	India . . .	10	Argentina . . .	15
United Kingdom	39	Pakistan . . .	14	Australia . . .	16
France . . .	26	Japan . . .	26	New Zealand .	41

¹ U.S.S.R. in Europe and Asia; pre-war average, 1934-38.

Exclusive of the U.S.S.R., the world average in 1950 was 16·6 bushels per acre.

The countries that stand highest in the list are mostly such as have a dense population and a system of agriculture that has been undergoing continuous improvement for generations—countries, accordingly, in which manure is cheap relatively to the value of the land, or those with rich soil only recently brought under cultivation.

Some cases of an exceptionally low yield per acre are worthy of special notice as illustrating the effects of different causes. In Victoria and Australia generally the low out-turn is to be ascribed mainly to the climate, which has but a scanty rainfall, and so is unfavourable to the tillering of the wheat and the filling of the ear, though it is warm and sunny, which is highly favourable to the quality of the grain. In recent years great improvements in yield have been effected. In South Australia the average yield in the decade 1939-49 was 12 bushels per acre; during part of last century it was about 5. In Russia the low average of the out-turns was, at least until recently, in great part due to the backward state of cultivation, for the soil on which much of the Russian wheat is grown is one of the best in the world. A large part of the wheat-growing area of Russia may, however, like those of Victoria and South Australia, be described as lying on the margin of adequate rainfall, so that the yield of crop varies greatly with the amount of the rainfall, and the same is true of such areas as the western Prairies of Canada and adjoining parts of the United States. In the years 1914-49 the yield of wheat in Victoria varied from a minimum of 1.38 to a maximum of 17.9, in New South Wales from a minimum of 2.98 to a maximum of 18.9 bushels per acre. In Manitoba the average yield in 1900 was less than 9, in 1901 more than 25 bushels per acre. These may be compared with the returns for Tasmania and New Zealand, in which the rainfall is more ample, and in which the extreme yields in 1914-49 were respectively about 9¹ and 27 and 22² and 37 bushels. In Argentina several causes combine to bring about a low average yield. In some years droughts destroy the crops (especially in the west of the wheat-growing area), in other years floods, in others frosts (especially in the south), but more than all these, locusts (especially in the north). Hence here also there are great variations in the calculated yield. In 1896-97 it was estimated at about 5 bushels per acre, as against 16½ in 1893-94, 14 in 1919-20, 18 in 1938-39, 12 in 1941-42, 15 in 1950.

The superiority of wheat as a food-grain for man depends chiefly upon the quality of the bread made from the flour, which is generally regarded as more palatable than any kind of bread made from other grains, even though these may be little, if at all, inferior to wheat in nutritive properties; but this superiority is so generally recognised that it is difficult for us to realise the fact that wheaten bread was a rarity even in some parts of England within the last century and a half. It is still a rarity, at least for the poorer classes, over a large part of the European mainland, though it is now coming more and more into use even among the poor. This result is solely due to the rapid extension of commerce since the introduction of steam-power. Europe, while constantly increasing its consumption of wheat

¹ In 1939-40; the lowest on record. Usually not less than double.

² The lowest yield on record from 1868 to 1949 was 18 bushels in 1897-98.

relatively to population, has been growing less and less able to supply its own wants in this article, and thus becoming more and more dependent on supplies from elsewhere. The consequence is, that the international commerce in wheat and wheat flour has not only come to exceed that in all other grains, but has grown to a magnitude rivalled only by that in a few other articles, such as cotton and wool, the two great clothing materials of the world. The great wheat-importing countries are those of the west of Europe, in which manufacturing industry is so highly advanced that there is a relatively large population dependent on supplies from abroad; and the United Kingdom stands at the head of the list, taking the largest share of the wheat export from all the great wheat-exporting countries, so that an account of the British wheat trade will serve to give a general view of the wheat supply of the whole world.

Early in the eighteenth century England could not only supply all her own wants in wheat, but in good years could even spare more than a quarter of a million bushels for export, and it was only towards the close of the century, after the great development of the cotton manufacture had begun, that the importation of grain became a regular necessity. The amount of the import continued on the whole to increase, notwithstanding the existence of import duties, which were generally fixed on a scale which imposed a very high duty when the price of wheat sank to a point which was then considered very low. In those days the chief supplies for the United Kingdom were derived from France and other countries belonging to the continent of Europe. From February 1, 1849, a uniform import duty of one shilling per quarter was established, and on June 1, 1869, even this was abolished, both wheat and flour being admitted into this country from that date duty free.¹ Meanwhile the dependence of the British Isles upon foreign wheat continued to grow, and so did the sources of supply, which also became more widespread. It has been estimated that shortly after the middle of the nineteenth century the United Kingdom produced on an average between 70 and 80 per cent. of all the wheat consumed in the country, whereas during the decade which preceded the Second World War the ratio was only just over one-fifth. During the first half of the decade it was still less; in the second half it rose to nearly one-fourth, home production being stimulated by the overthrow of the almost traditional British free-trade policy by the National Government in 1932, and the institution of a wheat quota.

The following table presents some of the most important facts relating to the British import trade in wheat since 1876. Up to 1900 the figures relate to the quantities *shipped* from each country; thereafter they are limited to the quantities *consigned* from each country—*i.e.* to supplies originating in each country.

¹ A duty of 3*d.* per cwt. on wheat, 5*d.* on flour, was levied in 1902-3.

*Imports of Wheat into the United Kingdom
(including wheat flour in equivalent weight of grain).¹*

Countries of Supply.	Average Annual Supplies in Percentages of Total.									
	1876-1880.	1881-1885.	1886-1890.	1891-1895.	1896-1900.	1911-1913.	1927-1929.	1930-1932.	1936-1938.	1948-1950.
United States: Atlantic Ports	41.8	35.4	32.5	41.6	49.7	—	—	—	—	—
Pacific Ports	11.5	18.1	15.6	10.5	9.9	—	—	—	—	—
Total U.S.	53.3	53.5	48.1	52.1	59.6	24.6	25.0	12.0	6.1	5.9
Argentina Republic	—	—	1.5	8.0	8.4	13.7	25.3	15.9	7.1	0.7
Canada	6.0	3.5	3.4	5.1	7.8	20.5	32.5	31.4	41.1	76.7
Russia	12.6	11.7	18.5	14.3	9.6	9.0	0.7	13.7	5.4	—
India	4.8	12.3	11.8	9.5	4.3	18.1	1.8	1.0	4.2	—
Australasia	3.7	5.2	2.4	3.0	1.7	10.9	11.9	18.3	26.6	15.5
Austria-Hungary	2.2	2.6	3.0	1.5	1.5	0.1	0.1	—	—	—
Germany	7.8	5.5	4.1	1.0	1.3	0.6	1.1	2.1	0.3	0.1
Others	9.6	5.7	7.2	5.5	5.8	2.5	1.6	5.6	9.2	1.1
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average Annual in Millions of Cwt.										
Total	63.31	76.78	77.79	96.58	95.37	118.8	121.7	123.7	110.7	98.1

¹ For purposes of conversion, the United Nations Food and Agriculture Organisation reckons that wheat yields 75 per cent. of its weight in flour. Grain of all kinds may be shipped either bagged or in bulk, but by the latter method about 12 per cent. additional weight can be carried and the cost of the bags is saved. One great advantage of the use of elevators is that they facilitate bulk transport.

These vast imports early led to a lowering of the British price of wheat, the mean of the yearly averages of the price of the imperial quarter (8 bushels) sinking from 54s. 6d. in 1871-75 to 22s. 10d. in 1894. This led to a rapid contraction in the area devoted to wheat, which in 1860 occupied about 4m. acres in the United Kingdom, and in 1895 under 1½m. acres. During the First World War efforts were made to increase the home production, but in post-war years acreage and production dropped again, the area in Britain in 1931 reaching a new low level of 1¼m. acres. Under the quota system introduced by the National Government in the following year, the acreage rose to 1,875,000 in 1935, and under the strict government control practised in the Second World War it reached nearly 3½m. acres (1943). This high level was not maintained, but in 1950 the acreage was still about 2½m. Both in 1951 and in 1952 the import of wheat and flour (reckoned as its wheat equivalent) was between 90 and 95m. cwt., compared with the pre-war import of 112m. cwt. (1938), while the export of British-milled flour, which in 1938 was equivalent to nearly 3m. cwt. of wheat, had dwindled to about 200,000 cwt.

If we now look at the **sources of supply** as shown in the table, we see that in the last quinquennium of the nineteenth century more than 75 per cent. of the total supply was shipped from the United States, Canada, and Argentina, the United States alone shipping just under 60 per cent. of the total. After 1900, the more exact system of assigning imports to the countries of supply reduced the lead of the United States; and the further decline, as the twentieth century advanced, in the American share of the total was due at least in part to the

development of the United States as a great manufacturing country. Canada and Argentina, on the other hand, gained in importance as sources of wheat supply to Britain, and Australia also became an important contributor. In Argentina, which first appeared in the British import tables as a source of wheat in 1883, the expansion was due to the opening up of a new region of virgin soil. Its share of the British imports of wheat was very erratic before the Second World War, and in the three years 1936-38 Canada and Australasia provided, on an average, over two-thirds of the total. During the war years Canada strengthened her already predominant position, and Australia and Argentina, though far behind, were other important sources of supply; while at the close the United States came more to the fore again. In 1951 Canada supplied 60 per cent. of the United Kingdom imports of wheat and flour (reckoned in terms of wheat), and in 1952 as much as 72 per cent. Australia and the United States were other major contributors. In 1952 Russia also was an appreciable source of supply, as Argentina had been a few years earlier.

This limitation of British wheat imports to practically three or four countries was the result of war and the aftermath of war. The pre-war sources of supply covered a wide range of countries, including not only those listed in the foregoing table, but many others, notably Roumania and France. The inclusion of France as a regular and considerable contributor was an example of the intricacies of modern trade, for in the pre-war quinquennium France did not grow enough wheat for home requirements, her imports being greater than her exports.

Despite the many contributories, normally, to Britain's wheat supplies, it remains broadly true that she is largely dependent on the newer countries of America and Australia; and the prospects of supplies from these sources—their continued maintenance, increase, or decrease—are of vital importance. Apart from political and financial considerations, which do not come within the scope of this work, the outlook is reassuring. Canadian experience is in many ways typical of the course of development, and a brief resumé will give an idea of the problems not only there but in the newer lands generally.

Wheat growing in Canada, though not confined to the Prairie Provinces, had its birth there, as a modern industry of world importance, following the building of the Canadian Pacific Railway in the 'eighties of last century. Grain crops, with wheat always in the forefront of the picture, were the mainstay of the pioneer settlers who flocked into the prairies, and farming was subject to the advantages and disadvantages of pioneer enterprise. The soil was virgin and fertile; land was abundant and cheap; the right type of settler might hope for a free grant of a quarter section (160 acres—a quarter of a

square mile). Big 'bonanza' farms of, say, 5,000 acres played a part in the development; but the typical farm was the holding of 160 acres, owned by the man who worked it with the help of his family and went all out to make it a success. Adverse factors were the 'extensive' as opposed to the 'intensive' type of farming, careless cultivation, and the tendency to crop the land year after year without observing a proper rotation or making good the loss of fertility. This 'wheat-mining', as it came to be called, meant low yields and threatened at one time a serious position in the Prairie Provinces through soil exhaustion. There was also the proverbial danger of having all or most of one's eggs in one basket. Happily, remedial measures were adopted, and if the danger has not been wholly exorcised a much healthier situation has been created by the spread of mixed farming, more thorough cultivation, measures to preserve soil fertility, and the development by scientific research of strains of wheat resistant to rust, drought, and other menaces. In the short-term view there must always be fluctuations of crop yield, dependent on good and bad seasons and other varying conditions. But in the long view, production is seen as a gradually mounting switchback. Local consumption naturally has increased with the spread of manufacturing industry and the growth of population, but by far the greater part of the production is exported. The very large share of Britain's imports of wheat supplied by Canada has already been noted; yet it is only a fraction of the Canadian production of wheat. In 1947, when the wheat and flour imported into Britain from Canada amounted to over 86m. bushels, the Canadian wheat crop was about 340m. bushels, and in the ten years ended in 1947 the crop averaged over 400m. bushels, while in 1952 it reached the record total of 688m. bushels, of which the three Prairie Provinces produced 664m.

The United States has been affected by more and greater changes than Canada has yet experienced. In 1870, more than half the population from ten years of age upwards who were gainfully employed were engaged in agriculture; in 1939-50, the proportion was about one in eight. Improvident farming has led to heavy loss of soil fertility and extensive soil erosion. But in the States, as in Canada, remedial measures have been adopted and recent years have seen record wheat crops, more than enough for home needs, vast as these have become. In 1947 a bumper crop of 1,267m. bushels was harvested, of which over a third was exported. Development has reached a different stage from that in Canada. There are in the United States six million farms. Two-thirds of them are either small holdings or family farms, worked with little if any hired labour; the other two million are what are known as 'commercial' farms, highly mechanised and worked mainly by seasonal contract labour. About seven-eighths of the agricultural produce of the United States that comes on to the market is from these 'commercial'

farms. More than a quarter of a million farms extend to over 500 acres each, and the number of such farms has been increasing, not only absolutely but relatively to the whole. In 1920 the average size of all farms was less than 150 acres; a quarter of a century later, in 1945, it was 190 acres.

The tendencies of modern farming practice, though not the exclusive concern of the wheat industry, have had an important bearing on its development. In both Canada and the United States it now exemplifies at every stage the triumph of modern methods of production, handling and transport. Countries which are developing manufactures and mechanising every industry naturally try to convert their raw materials into at least partially manufactured goods before export. A considerable proportion of the wheat imported into Britain from both Canada and the United States is in the form of flour. Sometimes other reasons than industrial policy call for prior manufacture. Hungarian millers are noted for the superb quality of their flour, not only because of the excellence of their wheat, their machinery and their methods, but because of the dry climate. Flour of equal quality cannot be made in the moist climate of Britain even from the same wheat treated by the same processes. Climatic conditions also determined the popularity of Indian wheats in Italy and other Mediterranean countries in former days; these hard Indian wheats yield the most suitable flour for making macaroni and vermicelli.

India's share (using the name India in its old sense) in bringing down the price of English wheat in the closing decades of last century was due, not to the opening up of vast new lands, as in North America, but to the cheapness of labour in old and populous countries. The climate of those regions in which wheat cultivation is chiefly pursued—the Punjab, North-West Province, and former United Provinces—is on the whole as favourable to the growth of wheat as the climate of the United States wheatlands, though in India insufficient rainfall often necessitates irrigation. The bulk of the Indian crop is grown for home consumption, and in most years there is now little or no surplus for export; in 1952, wheat had to be imported.

World production of wheat is estimated at between 5,000m. and 6,000m. bushels—four to five times the estimated total in 1883–84. The total for 1950 was 144·5m. tons (5,400m. bushels). Asia headed the list of production by continents, followed by North America and Europe, each of the three providing around 30 per cent. of the total. South America (chiefly Argentina), Australasia (chiefly Australia) and Africa, in that order, divided the balance of about 12 per cent. (650m. bushels).

The following table, the particulars of which, except in the case of North America, are mainly derived from Scherzer, shows that there is

not a month in the year in which a wheat harvest does not take place in some part of the world.

Date of the Wheat Harvest in Various Countries.

January	. Australia, New Zealand, Argentine Republic, Chile.
February	. India.
March	. India, Upper Egypt.
April	. Mexico, Cuba, Lower Egypt, Syria, Persia, Asia Minor.
May	. Morocco, Algeria and Tunis; the northern parts of Asia Minor, China, Japan, Texas, Florida.
June	. The Mediterranean peninsulas and the south of France; California, Oregon, Utah, and the greater part of central and eastern United States territory south of 40°; Afghanistan, Japan.
July	. France, Hungary, southern Russia, the northern parts of the United States of America, Ontario, and Quebec.
August	. England, Belgium, the Netherlands and Germany; the eastern parts of the Dominion of Canada.
September	. Scotland, Sweden, Norway, Russia.
October	. Finland, northern Russia.
November	. Peru, South Africa.
December	. Burma, South Australia.

MAIZE or CORN is the only grain-crop which was introduced into the Old World from the New, and it owes the name of Indian corn, by which it is frequently known in England, to the fact that it was the only cereal of importance cultivated by the American Indians before the discovery of that continent by Europeans. It weighs nearly as heavily as wheat (56 lb. to the bushel, against wheat's 60 lb.) and is in general a more prolific crop. World production (outside Russia) in 1950 averaged 25 bushels per acre, against the 16.6 bushels per acre of wheat; and on this basis it may be reckoned that maize yields, on an average, 50 per cent. more than wheat in volume and 40 per cent. more in weight. Its cultivation spread very rapidly in the tropical and some of the warm temperate parts of the Old World when it became known there, but much more rapidly in Africa, and even in the east of Asia, than in Europe, where the countries then most advanced in agriculture and industry were those in which the climate is least suitable for its cultivation.

Among other countries from which the cultivation of maize is excluded by the character of the climate is England, where the summer is not sufficiently long, warm, and sunny. The ideal **climate** for this grain is one with a summer $4\frac{1}{2}$ to 7 months long, without frost, the middle portion hot both day and night, sunny skies, sufficient rains to supply the demands of a rapidly growing and luxuriant crop, falling at such intervals as best to provide sufficient moisture without ever making the soil actually wet. It is thus essentially a summer crop, and one that requires summer rains (or irrigation), though not very heavy and frequent rains. It is therefore unsuited to those countries which, like California, Chile, and most of those round the

Mediterranean, though admirably adapted for the growth of wheat, are characterised by summers of remarkable dryness. It was this circumstance that seems chiefly to have caused the slow progress of its cultivation in Europe (except in Portugal), although it was gradually found to be very well adapted to the central parts of that continent, including northern Italy, and above all to the eastern parts (Roumania, with the adjacent parts of Russia), where the greater part of the rainfall of the year occurs in summer, and where the summers are at the same time remarkably sunny. The same characteristics render the climate of a great part of the United States eminently suited to this crop, which is, in fact, the principal corn-crop of the country; so that when a native of the United States speaks of 'corn' simply, it is always maize that he means, just as an Englishman means by the same word wheat. Around 60 per cent of the world production of 130–150m. tons of maize is grown in the United States. In the Commonwealth of Australia maize takes its turn with wheat in being the largest grain crop in Queensland, and in New South Wales it ranks next after wheat, though a long way behind. In South Africa it is the leading crop. The principal use of maize is as feed for cattle and pigs—the grain, meal and young juicy plants all being used. In the United States 'Corn Belt' the bulk never leaves the farm on which it is grown, save 'on the hoof.'

The quantity and value of the maize imported into the United Kingdom (chiefly for the feeding of cattle and horses) are next to those of wheat among grain crops. Down to the end of last century more than half the import was usually derived from the United States, which was followed by Roumania, but since then Argentina has come to the front, and from time to time has furnished more than half the import, while the share of the United States has often been quite small, though leaping up in bumper years to regain its old pre-eminence, as in 1951 and 1952. In both those years the Soviet Union rose to second place and Argentina fell away. The frequent and great fluctuations in the supplies received from one and another of the chief exporting countries are, indeed, very noticeable. Also, each year until now (1953) the total post-war imports of maize into the United Kingdom have been very much less than before the War. The great importers are the dairy-farming countries of northern Europe.

In the British Isles maize is used as human food only to a very limited extent, and chiefly in the form of the so-called 'cornflour'; but in many of the countries in which it forms a staple crop it is used as human food much more largely and in various forms. In the United States specially grown 'sweet corn' forms a favourite vegetable, the grains being eaten like peas in this country along with meat, and a preparation known as hominy—a kind of porridge made from coarsely ground maize—is locally used. 'Corn on the cob'

was becoming popular in Britain also before the Second World War. In Mexico maize is still, as it always has been, the principal food of the people, being coarsely ground at home and made into a kind of cakes called tortillas, which are eaten warm. The polenta, which forms a chief part of the food of the inhabitants of Italy, except in the extreme south, is generally made from maize-meal; and so too is the mamaliga of the Roumanians. In Trans-Caucasia the heads of maize are cooked under the name of kukurus. Maize is the staple food grain in nearly all the damper parts of Africa; and in South Africa 'mealies', as the corn cobs are called, and mealie meal enter considerably into the diet of the white races. Various kinds of beer and spirits are also made from maize, which is now used to some extent even by English beer-brewers.

OATS. This crop can be cultivated with advantage over a wider range in latitude and on a greater variety of soils than wheat; but the climate best suited to it is one that is moister and has cooler summers than that best adapted for the latter crop. Such climates produce grain of better quality for all the purposes for which oats are grown, and, moreover, produce a much greater weight of grain per bushel, the variations in this respect being much greater than in the case of wheat. Whereas wheat does not often weigh much more or much less than 60 lb. per bushel, oats grown in one place may weigh 50 lb., in another place only 26 lb. per bushel (F.A.O. average, 32-34 lb.). This is all the more important since there are also great variations in the amount of meal yielded by oats, only the best qualities yielding as much as half their weight. Oats are consequently grown chiefly in the more northerly and moister parts of Europe; but still, being more easily grown than wheat, the quantity of oats produced exceeds that of wheat in many European countries, except those on the Mediterranean, the summers of which are wholly unsuited to this crop. The largest crops are grown in Russia (north of the wheatlands), the United States, Canada, Germany, and France. In the British Isles oats are easily the leading cereal crop. This is the case even in England and is overwhelmingly true of Scotland with its cool summers (too cold for wheat except in favoured localities) and of Ireland with its damp conditions. Whilst wheat in England is almost restricted to the drier east the cultivation of oats is widespread. The total quantity of oats imported into the United Kingdom is only a small fraction of the imports of wheat and flour, but amounts to around 2m. cwt. Before the First World War, Russia was regularly the leading country of origin. In recent years the position has been very variable; in 1946-47 Canada was the chief source of supply, in 1948-49 Australia, and in 1950 Russia took the lead again. Oats are also a considerable crop in Argentina. World production (40-50m. tons) is about one-third that of either wheat or maize.

In those countries in which this grain is chiefly grown, it generally forms a part of the food of the people. In Scotland it constituted, in the shape of oatmeal porridge, oat-cakes, and other forms, the chief food of the people as late as the end of the eighteenth century; but it is mainly as provender for horses that oats are now grown, this grain being proved by experience to be the best for that purpose. In ancient times the grain was not much grown—no doubt in consequence of its unsuitableness for the climate of the countries round the Mediterranean, where the civilised nations of antiquity had their seats. It is not mentioned in the Bible, but it was cultivated in a small way in Italy, as food for horses, as early as the beginning of the Christian era. In central Europe it was a grain of much greater antiquity, for it is found among the remains of the lake-dwellings of Switzerland, but not, according to Prof. Heer, among remains of as great age as some of those which include grains of wheat.

BARLEY. This is in several respects a highly remarkable crop. By some writers it is believed to be the most ancient of cultivated grains. Several varieties of it (including two of that kind which is known in England as bere or bigg, having six instead of two rows of grain in the ear) have been found among the remains of the lake-dwellings of Switzerland. Its range in climate is wider than that of any other cereal, cultivation having led to the development of some coarse varieties which ripen their grain within a shorter period than the hardiest varieties of oats. Hence, of all cereals it is that which reaches farthest north in latitude, and highest up on the mountain slopes. In Norway it is cultivated even in 70° N. On the other hand, it flourishes well in any soil and under any climate that is suited for wheat, and it is in such climates that the best barley is grown. Thus it happens that it is the associate of oats in the northern countries of Europe, which are on the whole too cold for wheat, and the associate of wheat in the southern countries of Europe and the other countries round the Mediterranean, which are too dry in summer for maize, but where the barley, like the wheat, is of excellent quality. In the United States the state that grows the largest proportion of barley is California, which, like the Mediterranean countries, has a climate unsuited both for maize (except on irrigated land) and for oats.

Barley appears to have been the chief bread-plant of the ancient Hebrews, Greeks, and Romans, no doubt because it was the most productive of the grains suited to the Mediterranean climate, for the quantity of grain which it produces to the acre is usually greater than that of wheat (in England it averages rather less). In 1950 the world average was 1,056 lb. per acre (about 5 per cent. more than the average for wheat), or 22 bushels of 48 lb. Barley-bread was once common in Scotland, where it is still used to some extent, and it is likewise eaten in Scandinavia; but nowadays barley is principally grown for the sake of the beer made from malt, that is, from barley-

grain which has been allowed to sprout and then been killed. It is for this purpose that it is so largely grown in England; and for the same reason it is a very important crop in Germany and the other beer-drinking countries of Europe. About a third of the world production (40–50m. tons—much the same as the world production of oats) is grown in Europe, and this is supplemented by an import. Recently the import of barley into the United Kingdom has been a fourth or a fifth of the wheat and flour import, the principal countries of origin being Russia, Iraq, Australia and Morocco. The barley supplied by Asia Minor, not great in amount, is noted for its high quality. In Scotland and Ireland considerable quantities are used in the making of whisky.

RYE. This is the least familiar of all the grain-crops grown in the British Isles, but there is probably no other cereal except wheat that is cultivated so largely on the mainland of Europe as a bread-plant. It is grown on a much smaller scale (world production 20m. tons) than the cereals previously considered, and mostly (over 90 per cent. of the production) in Europe. Of all the bread plants it flourishes on the poorest soil and in the most inhospitable climates, though the optimum conditions are similar to those for wheat. It is a great boon to the vast tract stretching from Holland, through northern Germany, into central Russia, which is mainly covered by a poor, sandy soil. Throughout that region it is the prevailing bread-plant. In the United Kingdom, where grown at all, it serves chiefly as a fodder crop, for which purpose it is useful in the south of England in the period between the exhaustion of the supplies of root crops and the maturing of clover and lucerne. In the United States the use of the grain in the making of bread is diminishing, as the immigrants from northern and eastern Europe have got used to wheaten bread in place of the nourishing but sour rye bread of the old lands; but rye-whisky is popular and so is wheaten bread flavoured with rye. The straw, which is largely used for packing and making certain kinds of paper and pasteboard, is there regarded in many places as the most valuable part of the crop. Formerly, however, it was otherwise.

BUCKWHEAT. This is a grain-crop almost unknown to the agriculture of the United Kingdom, but of importance in many other parts of the world. It does not belong, like most of the grain-crops, including all those already mentioned, to the great family of the grasses, but is an ally of some of our common weeds, such as snake-weed and persicaria, and a more distant ally of the common dock or sorrel. It is a native of eastern Asia, and was introduced into Europe only at a late period. Its French name, *sarrasin*, appears to indicate that in that country it first became known through the Saracens or Arabs. The grain is said to be very nutritious, and the crop has these recommendations, that it can be grown with hardly

any cultivation on the poorest soils, especially, like rye, on very light, sandy soils, and that its sowing-time is late (in the United States from May to the middle of August), which often allows of its being sown to replace another crop that has failed. But against these advantages there are to be placed the great disadvantages that its yield is very uncertain, and that the very ease with which it can be grown encourages slovenly habits of cultivation. The only countries in Europe in which there is a considerable extent of ground under this crop are Russia and France.

PULSES. This is a general term rather vaguely used for certain pod-fruits—that is, fruits (in the botanical sense of that word) having large seeds enclosed in a long seed-vessel, the most familiar examples being peas and beans. The vegetable forms which have this kind of fruit are extremely numerous, and comprise lofty trees as well as tender plants; but the term pulse is confined to such as supply seeds or pods capable of being used for food by men or cattle. For the most part, the pulses of commerce are derived from green plants often weak-stemmed, but we may include under this head the fruit of two trees, the carob, or locust, and the mezquite.

The chief pulses of commerce are common peas and beans, chick-peas, and soya-beans. **Peas** are those suited to the coldest climate, and are largely cultivated everywhere in the less warm parts of the temperate zone, though not confined to these parts. Many varieties of the **common bean** (*Phaseolus vulgaris*, Linn.) are cultivated, some suited to one climate, some to another; some grown solely as food for horses and cattle, others eaten by man. The largest imports of beans into this country are from the warmer parts of the temperate zone, and also from tropical lands such as Madagascar. The acreage under beans in Great Britain and under peas is considerably less than in the later part of the nineteenth century. A distinction is made between 'field peas' and those grown in market gardens for immediate human consumption or for drying or canning for human food. The canning of peas in Britain has been greatly extended in recent years. **Chick-peas** (*Cicer arietinum*, Linn.) are an important product and article of trade in southern Europe and northern Africa, and also in India, where the crop is known as **gram**. In Spain they are one of the chief articles of diet of the people, and from Spain have become known in the former Spanish colonies of Cuba, Central and South America. In warm countries, where butcher-meat is little consumed, this and other pulses are in fact an almost essential part of the regular diet, since they supply elements of food not contained in sufficient quantity in grain and fruits.

It is for this reason that **soya-beans** are largely consumed in the Far East. The plant is indigenous to Eastern Asia, and it is widely cultivated there, especially in China and Manchuria, which before the

Second World War were credited respectively with a half and a third of the total world production of 12m. tons. China finds her market within her own borders, but Manchuria does a big export trade with other Far Eastern countries, and early in the present century extended her exports to Europe. In the pre-war quinquennium 1934-38 she provided 90 per cent of world exports of soya-beans totalling 2½m. tons. Not only the export of this bean but its cultivation has spread to Europe and North America. Such rapid headway has it made in the United States (in the cotton belt and the southern part of the maize belt), that in 1950 its acreage there reached nearly 14m. and the production about 8m. tons—nearly half the world total of 17m. tons, and rivalling the figures for China and Manchuria combined. Apart from direct human consumption, the soya-bean is useful for cattle food and for its oil content.

The **ground-nut** or earth-nut (*Arachis hypogaea*, Linn.) is so called because the pod ripens underground. It is popularly known also here and in America as the monkey-nut or pea-nut. Though cultivated chiefly as an oil-seed (see p. 224) it is also largely used as a fodder-plant and, increasingly, as human food. It is of remarkably wide range in latitude, being grown from the heart of the tropics to as far north as 37° in the United States, the northern limits of the cotton belt; and it thrives in very poor sandy soils. In recent years its cultivation in the United States, though still a relatively small factor in world supply, has extended to 3m. acres, and production to a million tons.

Among other pulses of more or less importance in agriculture and commerce are **lentils**, **vetches**, and **lupines**, all of which are cultivated for their pods in southern Europe and the Mediterranean region generally; lentils also in India. Lentils are celebrated for the nutritious character of their seeds and the meal derived from them is the basis of many invalid and other patent foods advertised under various names. In central and western Europe vetches and lupines are cultivated solely for use as green fodder, lupines being a crop of special importance in certain localities, from its being adapted to very light, sandy soils. In common with nearly all members of the pea and bean family, these crops enrich the soil; bacteria occupying nodules on the roots are able to 'fix' atmospheric nitrogen and convert it into nitrates available as plant food. (Cf. p. 59.)

The long flat dried pod of the **carob-tree** sold in our shops under the name of **locusts**, and sometimes called St. John's Bread, from the fact of its being supposed by some to be the locusts stated in the New Testament to have been eaten by St. John the Baptist in the wilderness, is the fruit of a tree (*Ceratonia siliqua*, Linn.) belonging to the Mediterranean generally, but especially abundant on the island of Cyprus. The pods have now become a considerable article of export from that island, and are sent to England to be used

for cattle-fodder. So rich are the Cyprus carob-pods in sugar that a sweet juice can be extracted from them capable of being used in preserving fruits, as well as for the other purposes to which sugar is applied. **Mezquite** is the name of several species of American trees of the genus *Prosopis*, producing a sweet pod something like that of the carob-tree. The most widely distributed species (*Prosopis dulcis*, Kunth), to which the Spaniards gave the name of the carob (algarrobo), after the similar tree of their own country, has pods nearly or quite two feet in length; but this is rather a tropical tree than a tree of the temperate zone. The species to which the name mezquite is given in North America (*P. juliflora*, DC, and *P. pubescens*, Benth.) have smaller pods, which, as well as the beans contained in them, are much relished by cattle. They are abundant in the north of Mexico and in the United States from Texas to California, and in western Texas, especially since forest fires have become less frequent.

POTATO. This important plant is one of the gifts of the New World to the Old. The cultivated species, which is known to botanists as *Solanum tuberosum*, Linn., and is hence a member of the same genus as our common weed the woody nightshade or bitter-sweet, is a native of the high and dry regions of the Andes from Chile to Venezuela, and its introduction thence into other countries has proved of immense importance on account of its extreme productiveness, its easy cultivation, and its remarkable powers of acclimatisation, varieties of this plant being capable of cultivation from the tropics to the farthest limits of agriculture, even beyond the polar limit of barley. There is much uncertainty as to the date of its introduction into Europe. It is believed to have been known in Spain in the first half of the sixteenth century, and is commonly said to have been introduced into Ireland by Sir Walter Raleigh from Virginia in 1586. Sir Walter Raleigh did not introduce any plant from Virginia about that time, though colonists originally settled in America by him may have done so. In any case, the plant first known in England as the potato was the batatas or sweet potato.

Whatever the date of introduction, it was long before the potato rose into favour in most European countries. In Ireland it was earlier cultivated than in Great Britain. In England its cultivation did not become general till the eighteenth century, and it was only in the latter half of that century that it came to be widely cultivated in Germany (where more potatoes are now grown than in any other country, except Soviet Russia), as well as in France, Austria, and Hungary. It even required the exercise of the autocratic powers of Frederick II of Prussia to effect its introduction into the sandy districts of Pomerania and Silesia. In north Germany the potato is said now to make up over half the food of the working-classes. It has long been known to be the staple article of diet of the Irish peasantry.

Owing to the great bulk of this commodity compared with its value, the foreign trade in it is carried on mainly with neighbouring countries. The greater part of the requirements of the United Kingdom are home grown, the import being of early potatoes, earlier than the home crop; they come from France, the Channel Islands, Spain, Netherlands, and Canary Islands. In the Channel Islands, cultivation of early potatoes is a staple industry, especially in Jersey, which is almost one large potato-field. The United Kingdom does a useful export trade in seed potatoes (over 50,000 tons). Poland and Ireland are the two chief producing countries per head of population (about a ton per head in either case). Germany, with a production of about half a ton per head, uses considerable quantities for the manufacture of alcohol (almost entirely for industrial purposes) and starch.

One great objection to the cultivation of the potato is its liability to disease, which in some years, as in 1845-46 in Ireland, has caused great distress in countries depending mainly on this crop. Great progress has, however, been made with disease-resisting varieties. Thus, formerly, potatoes would not thrive in the Fenland of eastern England, now the largest potato-growing tract in the country.

OTHER VEGETABLES. Amongst other vegetables which enter considerably into international trade may be mentioned onions and tomatoes. Onions are imported into Britain from (mostly) the Netherlands, Spain and Egypt. In quantity (over 200,000 tons a year) they exceed potatoes (150,000 tons), and vie with them in value. Imports of tomatoes (nearly 200,000 tons) are intermediate in quantity between potatoes and onions, but in value (£20m.) are half as large again as the combined value of the other two. They come chiefly from the Canary Islands (over half), the Channel Islands (nearly a third), and the Netherlands. Other vegetables—turnips, mangolds, carrots, parsnips, etc.—are mostly of too little value in proportion to their bulk to bear the expense of distant transport, and are chiefly produced at home. The area under turnips, swedes and mangolds in the United Kingdom is nearly as large as the area under potatoes, and the weight of production is nearly double.

FRUITS OF THE TEMPERATE ZONE, including nuts and edible seeds. Of all the familiar fruits suitable to a climate like that of England, by far the most important in the foreign commerce of the country is the apple, which normally is imported from Europe (chiefly Italy) and more largely from North America (Canada and the United States), Australia, and New Zealand. South and South-West Africa are also sources of supply. Despite a home production of 6-700,000 tons, imports both in 1951 and in 1952 were 3-4m. cwt., and though this was only half the pre-war import, the value was double (£12-14m.). There is also a considerable import of pears and plums and a smaller import of cherries, gooseberries, raw

currants, and strawberries. In addition there is a large modern trade in canned or bottled fruits.

But the bulk of the fruit trade of the United Kingdom is in fruits which cannot be grown at home, from lands with a Mediterranean climate or from the Tropics. The principal Temperate Zone fruits of this nature are the citrus fruits (oranges, grapefruit and lemons), grapes, currants and raisins, figs, almonds and other edible nuts, chiefly walnuts and chestnuts.

The orange (*Citrus aurantium*, Risso) is believed to be a native of China, where the tree is still cultivated with great care in the southern half of the country. From China it had already spread to other parts of southern Asia before the discovery of the sea-way from Europe to that part of the world, and from some part of southern Asia it was introduced into Europe by the Portuguese in 1548. It is now cultivated in several varieties in a great many places in tropical and sub-tropical countries. Its northern limit in North America extends in the west to about lat. 37° N., in the east to about 31½° N.; the bulk of the production is from California and Florida. In Europe its northern limit rises in western Portugal to about 40° N., and then, except in the valley of Andalusia, merely skirting the coast of the Iberian Peninsula, ascends to its highest, about 44° N., in the north-west of Italy. In Asia it begins in the west about lat. 37° (a degree and a half south of Izmir), and sinks in the east to about 34°. In the southern hemisphere, the limit is about 37° S.

The other species of the citrus genus of commercial importance are the **lemon** (*C. limonum*, Risso), the smaller-fruited **lime** (*C. limetta*, Risso), and the large thick-rinded **citron** (*C. medica*, Risso). The last species was the first to be introduced into Europe (not long after the beginning of the Christian era), and owes its specific Latin name to the fact that it was known to the Romans as a tree abundant in Media (the tract on the south-east of the Caucasus). All the species appear to be native in India. A hardier species of the genus is the kumquat (mandarin) of Japan (*C. japonica*, Thunb.), which is grafted on a wild stock that remains uninjured by frost. It yields a small fruit resembling the orange in flavour, though slightly bitter. Of recent years the larger fruited **grape-fruit** has become of commercial importance, and is largely cultivated in California, Florida, the West Indies, South Africa, and Israel.

Imports into the United Kingdom have not yet caught up with the pre-war quantities, though values have increased. It may give some idea of the magnitude of the trade to note that in 1952 the imports of oranges alone, which easily head the list of fresh fruits arriving in this country, amounted to 322,000 tons and were valued at over £18m. In the previous year they were larger still.

Formerly almost the entire quantity of oranges and lemons imported into the United Kingdom was derived from Spain and

Italy—the lemons more particularly from Sicily. The supplies were only available during one season of the year. Now oranges are available throughout the year from one or other of the chief exporting countries, the main suppliers to this country being Spain, Israel, South Africa, and Brazil. As to quality, the Maltese, Jaffa, Azores (St. Michael), and West Indian oranges were the most celebrated, the last being considered by some to surpass those of all other places, but the export is small and many varieties have been perfected in the newer countries. In India the oranges of Nagpur and the Khasi Hills have a high reputation, in the Argentine Republic those of Tucuman. **Limes** are grown for export, and for the making of lime-juice, more abundantly in the British West Indies (chiefly in Dominica, also in Montserrat) than in any other part of the world.

Figs can be cultivated in the Mediterranean region over a somewhat wider range than the orange, the tree which produces this fruit not being so sensitive as the orange to frost; but as a matter of fact they are grown for export mainly in the eastern part of the Mediterranean, and above all in Asia Minor, in the district lying to the north of those to which the orange is confined. The valley round Smyrna (Izmir), which carries on no orange cultivation, produces figs of peculiarly fine quality. Greece also produces excellent figs, both on the islands and the mainland; and so also does southern Italy. The necessity of cheap labour for packing the figs, which are exported almost exclusively as a dry fruit, is no doubt an obstacle to the cultivation of the fig, especially in those regions which are suitable also for the more valuable orange. The **apricot** is said to be to Syria what the fig is to Smyrna and Ephesus. The improvement in methods of drying and, above all, the growth of canning have made this fruit, as well as the **peach**, of great importance also in the newer 'Mediterranean' lands of California, South Africa, and Australia.

Grapes are of course produced wherever the vine is grown, but they are exported as a fruit chiefly from those districts which do not produce a grape suitable for wine-making. Large quantities of table-grapes are grown in this country, and elsewhere beyond the limit of regular vine-culture, in greenhouses. They are imported chiefly from South Africa, also from the Netherlands, Belgium, Italy, Greece, Spain, and (normally) the United States. **Raisins** and **currants** are dried grapes. Raisins are imported into this country chiefly from the United States, Australia, Asia Minor, and Greece. **Sultana raisins** are made from a seedless grape largely cultivated in Asia Minor and on some of the adjacent islands. **Currants** are the dried form of a still smaller seedless grape obtained from a variety of vine which appears to be one of the most exacting of all plants as regards soil and climate, and one that exhibits in the most marked manner the effect of local influences. The currant-vine is almost confined to the kingdom of Greece, and its product, formerly the most

valuable export of that kingdom, but now surpassed by tobacco, still holds second place. Even in Greece its domain is limited, and however carefully the vine may be cultivated, it is impossible to get equally good fruit in all the districts in which it is grown. The smallest, but sweetest and best flavoured currants are grown on the islands; on the mainland the best qualities are grown only at the head and on the south shore of the Gulf of Corinth. It was on this gulf, in the neighbourhood of the town of Corinth, of which the name currant is a corruption, that this variety of the vine was first cultivated on the Greek mainland. In between the two world wars, the output was carefully restricted, but competition arose from certain of the 'newer' countries where currants (and likewise sultanas) are now successfully produced (e.g. Australia).

Almonds, walnuts, and chestnuts—all, it would appear, originally products of the interior of Asia Minor, in the neighbourhood of the Black Sea—have all spread far west, and more or less north. Almonds are chiefly imported into Britain from Italy, Spain and Portugal, Morocco and Iran, but are also produced in considerable quantity in France. Walnuts and chestnuts have penetrated much farther into the heart of Europe, and are imported into this country chiefly from France and Spain. Among other southern fruits of slight importance in commerce are the **prickly pear**, the black-spotted pear-shaped fruit of a cactus, introduced into southern Europe from the drier parts of tropical America; the **black mulberry**, the **pomegranate**, and the **pistachio nut**. **Avocado** or **alligator pears**, the fruit of a West Indian tree, have become popular in salads.

WINE. From a geographical point of view, and more particularly, as will appear further on, from the standpoint of commercial geography, the vine is one of the most interesting of all economic plants. Its original home seems to have been somewhere in western Asia or the south-east of Europe. According to Hehn, the region from which it spread is the luxuriant country to the south of the Caspian Sea, part of the ancient Media. 'There in the woods the vine, thick as a man's arm, still climbs into the loftiest trees, hanging in wreaths from summit to summit.'¹ But it appears to be indigenous as far east as Afghanistan and as far west as the Carpathians.²

How early the must, or juice of the grape, was converted into wine we know from the Hebrew Scriptures; and the virtues of this product in process of time caused the spread of vine-culture wherever civilisation advanced along the shores of the Mediterranean, as well

¹ Hehn's *Wanderings of Plants and Animals*, p. 73 (Eng. ed.).

² Remains of vine-leaves have been found in prehistoric tuffs at Montpellier and elsewhere in the south of France, and grape-pips round the lake-dwellings of Switzerland, while fossil relics both of the vine and fig (*Ficus carica*) have been found in the Quaternary travertine of Miliana in Algeria.

as eastwards, through the drier parts of Asia. By Europeans the vine of the Old World was introduced into America, where, however, there are native species (*Vitis labrusca*, L., &c.), now cultivated as wine-plants. The spread of vine-cultivation is still going on, and the vine is rapidly extending over the whole domain suitable to it throughout the world.

The limits set to its cultivation by climate are somewhat rigorous; for though there are many varieties of the vine, as of all cultivated plants, there are none adapted—like some varieties of maize, for example—to a comparatively short summer. A moderately high temperature, extending far into the autumn, is essential to the maturing of the grape, so as to make it fit for wine-making. In Europe, a mean temperature of about 60° in the month of September is one of the conditions of successful cultivation; and it is this fact chiefly which explains the form which the northern limit of the vine as a wine-plant assumes in both the Old World and the New. In western Europe, where the temperature is subject to moderating influences both in summer and in winter, the northern limit is in about $47\frac{1}{2}^{\circ}$ N., a little to the north of the mouth of the Loire, but it gradually rises eastward as the summers get warmer, until in the western part of the republic of Poland it reaches its highest latitude anywhere in the world, about $52\frac{1}{2}^{\circ}$ or 53° N. As we go still further east the summer in equal latitudes gets shorter though warmer, and hence the September temperature declines. Consequently, the wine-limit gradually sinks to the shore of the Sea of Azof, where it is further south than in the west of France. The extremely sunny character of south-eastern Russia causes it, however, once more to rise a degree or two, but it again sinks in Asia to about 40° or 41° . The corresponding limit on the American continent has a similar form, but exhibits the advantage belonging to Europe in respect of climate. It begins in California about 37° N., rises to above 42° N. in the Canadian province of Ontario (owing partly to the moderating influence on climate exerted by the Great Lakes), but declines again slightly in the United States. In the southern hemisphere the limit is about 40° S.

But while the range of cultivation of the vine is thus limited on the north and south, it is important to observe that the habit of the plant gives it one great advantage within those limits. The roots of the vine-stock penetrate the soil to a great depth; and this fact, besides placing the roots beyond the reach of frost, which is important in those regions in which a summer of sufficient length is succeeded by a winter of great severity (as in some parts of Russia and central Asia), enables it to draw on deep stores of moisture, and thus without irrigation to flourish and to continue to produce its tender leaves, even in those parts of the Mediterranean in which the summers are nearly rainless and almost all other vegetation is then at a standstill.

Lastly, with respect to the range of the vine as a wine-plant, it is to be noted that the limits above described are not fixed solely by climate. They are fixed partly by commerce. They are not the limits within which the vine can grow and yield grapes whose juice can be made into wine, but the limits within which wine of tolerable quality can be produced—that is, wine sufficiently good to have a commercial value. In former times the vine was cultivated as a wine-plant in the valley of the Severn, and in several of the southern counties of England, as well as north of its present limits on the mainland of Europe, but the advance of commerce bringing better wines from more favoured regions has caused vine-growing to be given up in those places. It was only the employment of a large amount of capital for the production of wines of high quality that made it possible for the Marquess of Bute to grow the vine for that purpose near Cardiff with good results in favourable years, and in the end the experiment was given up.

The amount and quality of the wine obtainable from grapes in different places vary greatly from different causes. In the first place, the fruit of the vine is greatly affected by differences in the soil and climate. A sunny climate without excess of rainfall is that which is best adapted to it, and hence it is often grown, especially in the more northerly districts, on hill-slopes exposed to the sun, the slope favouring the draining away of superfluous moisture. The excess of summer rains prevents the cultivation of the vine for vine-making in monsoon countries such as India and China. The best soil for the vine is one both warm and retentive of moisture—that is, one that retains enough moisture without being wet; and it is the combination of these characters that makes chalky and other limestone soils so suitable for viticulture. But, secondly, the preparation of wine of high quality from the must is an industry that demands great skill and experience, and consequently is practised on a great scale only where the industry is of long standing, and where the state of industry is sufficiently advanced to afford the necessary capital and labour. And, thirdly, the vine is subject to many diseases, some of which have at times committed such ravages in vineyards as greatly to reduce, and occasionally almost to extinguish, the wine industry in certain districts. A fungus (*Oidium Tuckeri*, Berk.) after about the middle of the nineteenth century committed extensive ravages in the Mediterranean region and among the vineyards of Madeira. Since about 1863 the vines of France and many other countries have suffered even more severely from an insect enemy—the well-known phylloxera, which reached Madeira in 1878 and took ten years to extirpate there. In France alone upwards of a million acres of vineyards were reported to be infected by the disease due to this insect in 1885, and more than 2m. acres had already been destroyed.

France still leads the world in production of wine, but it is

necessary to go back to 1875 for the maximum area (nearly 6m. acres) on which the vine was cultivated in that country. In the next ten years, 1876-85, production averaged 940m. gallons—less than half the output in 1875. Following the phylloxera ravages, which reached their height about 1890, many vineyards were replanted with American vines, which are less liable to the attacks of the insect. By 1902 the area under vines had fallen to less than 4½m. acres, but the vines were stronger, and in normal years much more productive, relatively to area. In the first quinquennium of the century, production averaged 1,126m. gallons, and though it suffered a sharp setback during the First World War, afterwards it advanced again till in 1934-38, when the area had further fallen to under 4m. acres, production averaged 1,378m. gallons. Averages do not tell all the story. Vintages are always very variable, being much affected by the weather as well as by disease and pests. In France the yield ranges between extremes of about 100 gallons and over 300 gallons per acre.

The effects of the Second World War were much the same as the First. Countries overrun by war could not maintain their output of wine, while countries outside the field of conflict increased theirs; but after the War the former mostly recovered the lost ground, while some of the latter had difficulty in retaining their gains. The adjoining table shows for each of the main producing countries, exclusive of Russia, the output in the year immediately preceding the War (1938); the year which saw the end of hostilities (1945), when world production was at its lowest; and the latest year for which returns are available (1951). The arrangement of the countries is alphabetical, under continents. To appreciate the experience attributed above to countries which were not overrun by war, it should be noted that the high level of their output was reached during the War, not in 1945, when world production in general was at a low ebb. Spain, for instance, had a maximum output of 471m. gallons in 1943; Portugal a maximum of 319m. gallons in 1944; Argentina a maximum of 235m. gallons in 1943.

The 1951 figures do not show the full measure of post-war recovery, but are an example of what has been said about the annual crop fluctuations. In 1950, world production of wine was estimated at 4,218m. gallons, and the drop of 232m. gallons in 1951 was more than accounted for by a decline of 392m. gallons in the French vintage, which in 1950 had amounted to 1,433m. gallons, or more than the output in 1938.

France does not only take the first place as regards the quantity of its wine-production. Its most celebrated wines—such as the **clarets** or Bordeaux wines, from the best vineyards of the basin of the Gironde; **champagne**, grown on the chalk hills of the old province of that name; and **burgundy**, named from another old pro-

vince—are among the best of old wines. The last named is grown at its best on the 'golden' slopes of the Côte d'Or, where that range looks down on the warm valley of the Saône.

Annual Production of Wine, in Million Imperial Gallons¹

	1938	1945	1951		1938	1945	1951
<i>Europe:</i>				<i>Africa:</i>			
Austria	21	13	24	Algeria	473	206	302
Bulgaria	52	54	50	Fr. Morocco	17	5	20
France	1,320	629	1,041	Tunisia	43	14	16
Germany	50	40	68 ²	South Africa	33	52	62
Greece	103	54	97				
Hungary	68	69	75	<i>N. America:</i>			
Italy	919	644	1,000	Canada	4	4	4
Portugal	241	224	163	United States	120	160	200
Roumania	218	123	100				
Spain	352	304	287	<i>S. America:</i>			
Switzerland	8	13	23	Argentina	204	160	190
Yugoslavia	103	70	130	Brazil	18	21	26
				Chile	79	65	77
<i>Asia:</i>				<i>Australasia:</i>			
Cyprus	5	3	3	Australia	20	14	28
				TOTAL	4,471	2,941	3,986

¹ Based on the Commonwealth Economic Committee's Report "Fruit" (1952).

² Western Germany only.

The export trade in French wines is large and valuable. Until the ravages of the phylloxera began there was only a trifling import to set against this large export, but since 1880 the wine imported into France has exceeded in quantity the amount exported. The present difference is less than the difference before the Second World War, but in 1951 the imports were still nearly eight times the exports. There is not, however, the same difference in value, the imported wine being chiefly an inferior commodity from Algeria, Italy, and the north-east of Spain. The explanation of this large import is twofold. First, the fixed habits of the people lead to a larger consumption of wine per head in France than in any other country; second, France retains the reputation which it has long had in foreign countries, and especially in England, for its light wines, and hence there is a constant demand abroad for French wines.

In quantity Algeria easily leads the world as an exporter of wine, providing about two-thirds of the world total of such exports. Spain and Portugal come next, and together with France and Italy, Tunisia and Greece, provide almost the whole of the remaining third.

Of the **wines of Italy**, though some were celebrated in classical times, only a few are favoured by connoisseurs; one of the best known is Chianti. Some of the **Spanish wines** have long been in high repute,

especially in England, the most noted being those strong southern wines which take the name of **sherry** (formerly sherris) from the town of Jerez de la Frontera, near the seaport of Cadiz, in which district the best sherry is still produced, as it was in the days of Falstaff. A greater quantity of wine, however, is produced in the north-east of Spain, in the provinces of Barcelona, Zaragoza, &c. The wines of Portugal are, except light wines near Lisbon for local consumption, chiefly grown in the basin of the Douro, and that which is exported is shipped at Oporto. In England these wines are known as port; indeed, by law, the name 'port' may not be used except for these wines. Of the wines of Central Europe the most celebrated are those of **Hungary** (especially Tokay). **Germany**, though low in the list of wine-producing countries in respect of the quantity of its output, is noted for the fine quality of the vintage of some of its valleys, and above all those of the warm valleys of the middle Rhine and its tributary streams, the Moselle and the Neckar. The celebrated Taunus wine is grown on the slopes of the hills that shut in on the north the broad flat valley between the Vosges and the Black Forest.

In the **United States** the cultivation of the vine, despite recent increases, has not attained the extent that might have been expected, but it has had attention, especially in **California**. During the prohibition period, manufacture of wine was forbidden and thousands of acres of wine-grapes were destroyed. The repeal of prohibition in 1934 gave a new impetus to vine cultivation, and in 1951 California produced 624,000 tons of wine grapes, 683,000 tons of table grapes and 107m. tons of raisin grapes; in all, 3m. tons of grapes.

In **Algeria** the spread of vine-culture since 1878, when it was in its infancy, has been very rapid. The vine was introduced into what is now the **Cape Province** in 1653, soon after the arrival of the first European settlers. The part of South Africa where the first settlements were made has a climate very similar to that best adapted to the vine in Europe, and there it has proved very productive. Large quantities of the fruit are used as table grapes or converted into raisins. The production of wine has increased and, in addition to a considerable home consumption, wines of the hock, claret, and burgundy types are popular in England. A proportion of the grapes is also used in making brandy and other spirits, but the production under this head has greatly declined. There are several government vineyards where experiments are carried out. The **Australian** production of wine is increasing, and several wines of that origin, especially of the burgundy and port types, have already found favour in the home market. South Australia, Victoria, and New South Wales are the chief states in which the vine is grown.

The **British trade in wine** is affected by the existence of a customs duty which varies according to the proportion of spirit contained

in the wine. The countries from which the greater part of the British import is derived are France, Spain, and Portugal, despite a preferential tariff in favour of Commonwealth wines. A considerable proportion of the wine imported is re-exported, being sent to all parts of the world. The quantity of wine retained for home consumption in the United Kingdom, relatively to population, steadily declined from .56 gallon per head in 1876 to .30 gallon per head in 1886, which remained the minimum till 1900; it was roughly the same before the Second World War. For the sake of comparison it may be mentioned that in France the consumption in 1876 was rather more than 30 gallons per head; but that was the year after the unparalleled crop of 1875. In 1877 the rate dropped to 28 gallons, and later it declined still further, but before the last war it was between 35 and 40 gallons, and had been known to exceed the latter figure.

HOPS. The hop-vine is a slender-stemmed, twining and climbing plant cultivated for the sake of its clusters of small greenish flowers, used as a seasoning for beer, to which they impart a bitter flavour. In cultivation it is allowed to twine round upright poles or cords or wires. There are two kinds of flowers on different plants, one which can and one which cannot produce seeds, and it is only the former that can be used for the purpose mentioned. The countries in which the plant is most largely cultivated are England, Germany, the United States, and Czechoslovakia. The yield is very variable. Notwithstanding a pre-war production averaging about 12,000 tons, the United Kingdom imported another two or three thousand tons and exported only a few hundred tons; but since the Second World War, home production has increased (18,000 tons in 1950), imports have almost disappeared, and exports have risen (1950-52) to 4-5,000 tons a year valued at between £2m. and £3m.

The obstacle to further extension of home production lies in the fact that hops are a very exhausting crop, requiring to be grown only on the richest soil and needing a plentiful labour supply at harvest time. In England, the crop is mainly grown in the weald of Kent, where 'hop-pickers' drawn from the poorest districts of eastern London combine work with a summer holiday. Besides Kent, the principal county producing this crop is Hereford. It is not grown at all in the northern counties. Besides being grown only on rich soil, the crop is in England generally very plentifully treated with manure, so that the average quantity produced to the acre is much greater in this country than it is elsewhere except in Australia.¹

In Germany hops are chiefly grown in Bavaria, especially in the division of Middle Franconia. Before the Second World War this crop extended very rapidly in Alsace-Lorraine. In Czechoslovakia

¹ In the three years 1948-50, English crops averaged 13.5 cwt. per acre, German 7.1, Australian 15.6.

the chief hop-growing area is the Czech or Bohemian plateau around the famous beer-brewing centre of Plzn or Pilsen. The hop as a cultivated plant was introduced into England from Belgium (Flanders) only in 1525.

BEET. This is the common name for several varieties of a widely cultivated species of plants (*Beta vulgaris*, Linn.). They have large broad leaves and long tap-roots, and it is principally for the sake of the latter that they have been introduced into agriculture. One variety is extensively grown in this country, under the German name of **mangold** or **mangel-wurzel**, as food for cattle, like the turnip. Requiring a hotter and drier climate than this latter crop, it is mostly grown in the southern and eastern parts of England, and, being sensitive to frost, it is banished from those parts of the island in which the summers are short or the situation too exposed.

Another, and now a much more important variety, the sugar-beet, became in the course of the nineteenth century the great rival of the sugar-cane in the production of sugar. This variety is now cultivated over a very large area that has steadily grown in central Europe, stretching from France, through Holland, Belgium, Germany, Czechoslovakia and Poland to Roumania and South-western Russia (the Ukraine). Under the protection of high duties sugar is extracted and refined in the United States from beets grown in many states in the north and west, and there are now hardly any parts of the world with a suitable climate in which sugar beet is not cultivated. See the Sugar Industry, p. 208; also, for British experience, p. 325.

FLAX. Flax is a plant remarkable for the variety of useful products which it yields, as well as the variety of uses to which these products can be put, and hence is well called by botanists *Linum usitatissimum*, Linn. The fibre of the bast, or inner bark of the stem, which is tall and slender like that of the cereals, but not unbranched, is from eight to upwards of fifty inches in length. This fibre is itself called flax, and from the earliest times has been spun and woven into a fabric known as **linen** (from the Latin name of the plant). Manufactured flax fibres have been found in the remains of the prehistoric lake-dwellings of Switzerland. The seed (linseed) yields an oil largely used in making paints, and, in its greatest purity, in making varnish. The crushed cake that remains after pressing out the oil is an excellent food for cattle. Also the seeds, when ground, afford the linseed-meal which is so much used medicinally. The tow, which is composed of the shorter fibres of the flax, those not used for weaving, is spun into twine and cords, and linen rags furnish one of the best materials for paper-making.

Flax is grown through a wide range of climate. It thrives both in India and in the colder parts of Russia, in the United States and Canada, and especially in Argentina—these five being easily the countries of largest production. It is a very variable crop, much

dependent on weather conditions from year to year. Its chief commercial value in any given area derives from either the fibre or the seed: where, as in India, the plant produces the best seed for oil, the fibre is nearly valueless; and where the fibre is good, as in Russia, the seed is of less value, though in that country flax is grown both for the oil and the fibre. Far more crops are grown for linseed than for flax. Crop returns do not always distinguish between the two, but whereas the total acreage, at its wartime peak, was upwards of 21m. acres, the peak area cultivated for flax was estimated at 6½m. acres. In Argentina, India, Canada, and U.S.A. cultivation is almost entirely for seed (see under Oil Seeds, p. 223); in the Soviet Union it is mainly for fibre. Normally the output of fibre in the Soviet Union is greater than in all the other countries—about three-fourths of the whole. In 1938 it was 592,000 tons out of a world total of 791,000 tons; in 1946, 172,000 tons out of 304,000 tons; in 1950, 600,000 tons out of 774,000 tons. Though the flax plant is adapted to extremes of climate, the best fibres flourish in a temperate climate, such as that of Europe. Belgium, especially, is noted for the quality of its flax. Flax of excellent quality is grown in considerable amount in the north-east of Ireland, in the whole of which island it is a culture of great antiquity.

The soil best suited for the growth of flax for the fibre is one that is tolerably firm and moist. This latter circumstance is what renders the flat surface of Russia and Ireland so well suited for its growth. But there are other conditions besides soil and climate which have an important influence on the extent of flax cultivation. Flax is one of those crops which require the employment of a good deal of labour on the field before the fibre is ready for the factory. For the unprepared flax straw there is in England no market, and to be made ready for the market the flax has to undergo a number of processes which are apt to make extensive demands on the labour attached to a farm at a time when it is much needed for other purposes. In the first place, instead of being cut like grain, flax has to be pulled up by the roots. Next, if it has been allowed to seed, it must be ripped—deprived of its seed-vessels by means of an iron comb. After that the straw has to be retted, that is, steeped in water for about a month so as to rot the soft tissue but leave the fibre and the woody core. The quality of the fibre depends largely on this operation, for which the water should be soft and stagnant or nearly stagnant. Finally the straw is scutched, or subjected to the action of a machine with revolving blades, which gets rid of the woody core of the fibre.

It is the labour required for these processes that chiefly prevents the cultivation of flax in England and Scotland. Both before and during the Second World War efforts were made to extend its cultivation in Britain, but with little success, though the plant is quite suited

to the climate and there is every inducement to grow it, for though the quantity imported of flax alone has dropped from 40,000 tons in 1938 to 28,000 tons in 1952, the value has gone up from £3·4m. to £8·6m. An extensive linen industry has its chief seats in the north-east of Ireland around Belfast and at Dundee and Dunfermline, Scotland. On the continent this industry was most highly developed in Germany (where Westphalia is most noted for the quality of its linens), Czechoslovakia (especially Bohemia), and Belgium.

Lawns and cambrics are among the special fabrics made from flax. The latter is named from the French town of Cambrai, where the manufacture is still carried on. The canvas of sail-makers, formerly, as the name (see below) indicates, made from hemp-fibre, is now, in the United Kingdom at least, made chiefly from flax or cotton.

HEMP (*Cannabis sativa*, Linn.) is a plant the bast of which yields a fibre similar to that of flax, only coarser and stronger. It is used chiefly (in England almost solely) for ropes and cordage, and the fabric woven from it, which takes the name of canvas, from the Latin name of the plant, was principally used in making sails. The finer kinds of fibre are, however, used in making a cloth similar to linen, and hemp yarn, like linen yarn, is frequently combined with other yarns in weaving. Like flax, hemp is adapted to a wide range of climate; but the soil and climate best suited to it, when grown for the sake of the fibre, are similar to those required for flax, and the mode of cultivation and after-treatment of flax are likewise suitable for hemp. Hence the countries of chief production are the same. Russia stands first as regards quantity, but Italy, which comes second in quantity, has the reputation of producing the hemp of the finest quality (that grown round Bologna). In the United Kingdom hemp is even less grown than flax, and is now rarely seen. In India hemp is very extensively grown, but chiefly for the sake of various stimulants derived from it.

The term 'hemp' is also applied to a number of other fibres, some tropical, some extra-tropical in their origin, adapted to the same uses as the true hemp fibre. By far the most important of these are two tropical products, manila hemp and sisal; and among other tropical 'hemp' products are sunn-hemp and Deccan hemp (see pp. 214, 603). Among plants belonging to temperate climates, the so-called **New Zealand flax** (*Phormium tenax*, Fort.) is much better suited to the purposes of hemp fibre than to those of flax fibre; it is, indeed, sometimes called New Zealand hemp, but its ordinary name now is **phormium**. The fibre is derived from the leaves, which are long and narrow like those of the yellow iris. The plant grows very abundantly in New Zealand and is very easily cultivated. It thrives on inferior boggy soil, almost useless for other purposes,

and it has been grown in several of the south-western counties of Scotland. The use of the fibre in manufactures is, however, impeded by the difficulty in freeing it from a gum by which it is invested, and the industry is maintained with difficulty. Exports of phormium fibre from New Zealand reached a maximum of 27,877 tons in 1905. Since then production has declined. In 1940 eighteen mills, employing 216 people and treating 29,872 tons of leaves, turned out 3,613 tons of dressed fibre and 443 tons of tow. During the war, production sank lower still, and the annual export of phormium fibre was under 500 tons. In 1950 the exports of both fibre and tow amounted to less than 800 tons.

Of the other fibre-yielding products of the temperate zone, the most important is **esparto**, or, as it is called in North Africa, **alfa**. These are the commercial names of various grasses (chiefly *Stipa tenacissima*, Linn., but also *Lygeum spartum*, Loeffl., and *Ampelodesma tenax*, Linn.), derived from northern Africa (Algeria and Tunisia) and southern Spain, and used chiefly in paper-making. In Spain esparto fibres are also employed in making ropes and cordage as well as in plaiting. Imports of esparto into the United Kingdom in the five years 1934–38 averaged 313,671 tons. In the five post-war years, 1948–52, the average rose to 326,000 tons, and would have been more but for a sharp drop in the imports in 1952 to 238,000 tons. In the first four years of the quinquennium they did not fall below 300,000 tons, and in 1951 reached a maximum of 389,000 tons valued at £15m. North Africa furnished the great bulk (over 90 per cent.) of these imports, mostly from Algeria and Tunisia, with Libya as a smaller contributor.

WOOL. Wool is the name given to a kind of hair found in greater or less quantity on almost all mammals, on a few of which it forms the principal covering of the body. From ordinary hair it is distinguished by two important properties. First, while a hair is almost quite smooth on the outside, each fibre in wool is covered with minute overlapping scales, the edges of which are turned in one direction like those of the slates on a roof. These scales are, however, extremely minute, so that they cannot be discerned by the naked eye or by the touch, unless a woollen fibre be drawn between the fingers in the direction opposite to that in which the edges of the scales are set. Second, each fibre of wool is finely crimped or curled, so that when drawn out it becomes greatly lengthened, returning again to its original length when the strain is removed. It is the spring due to this curl which imparts to woollen fabrics that elasticity which distinguishes them from those made from cotton, linen, and other fibres. Another distinguishing property of wool is its power of felting—that is, of becoming matted in such a manner as to be capable of being made into a kind of cloth without weaving, but merely by rolling, beating, and other processes.

The animal that furnishes by far the largest proportion of the wool of commerce is the domestic **sheep**, the woolly covering of which is almost entirely a product of domestication. Several different species of wild sheep are indeed known, one of these, the mouflon, still surviving in a few of the mountainous parts of southern Europe; and some of the species of wild sheep which inhabit the elevated regions of central Asia are known to produce, like other natives of the same part of the world, considerable quantities of winter wool. But no wild species of sheep possesses the well-known woolly fleece, which is one of the principal products for the sake of which the domestic sheep is reared. When the sheep was first domesticated it is impossible to say. The pictures on the ancient Egyptian monuments bear witness that the Egyptians owned domestic sheep at a very remote period, though there are no pictures of this animal so old as some of those of the horse and ox.

In all countries suited for rearing it, the sheep is now the most numerous of domesticated animals, and in most of these it is chiefly for the sake of the fleece that it is reared. The climate best adapted to the sheep as a wool-producer is one that is comparatively dry and equable, or at any rate free from extremes of cold. The grassy tracts of the Mediterranean countries are accordingly peculiarly favourable to it, and it was in that region that the **merino** sheep, the variety which now produces fine wool in all parts of the world in which it thrives, originated. This variety, which is characterised by its dense and soft fleece, and fine but strong and very curly fibre, was first known in northern Africa, and was thence introduced into Spain about the middle of the fourteenth century. In Spain, which even in Roman times was renowned for the excellence of its fleeces, the variety was still further improved by careful rearing. In the seventeenth century the finest cloths of western Europe were all made from Spanish wool, and Spain retained its reputation for wool till long after that period. At the present day, however, Spanish wool, owing to the neglect which the sheep-rearing industry along with others experienced for centuries in Spain, is far eclipsed by the produce of other countries, and in quantity it takes a very unimportant place in the commerce of the world.

The country which first bore the palm from Spain for its wool was Saxony, into which the merino sheep was introduced towards the middle of the eighteenth century. Upon the rearing of this variety the Saxon sheep-owners bestowed the greatest care, and in consequence of that care, rather than because of any superiority in climate, the so-called 'electoral'¹ wool rapidly attained the first place in the market. Silesian wool, produced in the Prussian

¹ So called because in the eighteenth century Saxony was an 'electorate'—that is, its ruler was one of the princes entitled to vote in the election of the emperor of the Old German Empire.

province of Silesia, soon came to rival it from the same cause, and another rival is sometimes found in Bohemian (Czechoslovakian) wool. With regard to English wool, it must be explained that wools generally are classed in two great divisions, adapted for different purposes, the length of fibre or staple having been formerly the distinguishing character between the two, and it is mainly the long-stapled variety for which English wool has a reputation. The English breeds of sheep which take their names from the counties of Leicester and Lincoln are among the finest of the 'long-stapled' class. To illustrate the effect of local conditions on the quality of sheep's wool, an effect which is very marked in many parts of the world, it may here be mentioned that, while these breeds produce in the counties named, and in Yorkshire and Nottinghamshire, a highly lustrous wool, their fleece rapidly loses in brilliancy in other counties. In the Middle Ages wool was by far the most valuable of the English exports. It is still the principal agricultural export of the United Kingdom, though for many years the production of British wool has gradually declined—from an annual average of 159m. lb. (greasy basis) in 1871-75 to 111m. lb. in 1934-38. Exports were better maintained during this period; until shortly before the First World War they increased considerably, and though not increasing at the same rate in later years they continued to form a growing percentage of the diminishing production. In the quinquennium before the Second World War they averaged 43m. lb., or nearly 40 per cent. of the production.

The decline during the Second World War, and the subsequent near-recovery, are shown in the following table. The figures for production are on a greasy basis—i.e., for wool in its natural condition. The export figures are for partly greasy and partly clean wool; if the exports were all on a greasy basis, their calculated percentage of the home production would be still larger. It may be noted that in the Board of Trade returns the exports of raw wool described as "Produce and Manufactures of the United Kingdom" include not only British home-grown wool but imported wool which has been treated for export. The figures in the table are for home-grown wool only.

Production and Export of British (Home-grown) Raw Wool

Production		Export		Percentage Exported
Year	Million lb.	Year	Million lb.	
1937-38 .	104	1938 .	30·1	29
1940-41 .	114	1941 .	21	18
1943-44 .	90	1944 .	1	1
1947-48 .	75	1948 .	10·3	14
1949-50 .	88	1950 .	25·4	28

In 1952, exports of close on 29m. lb. were valued at nearly £7½m.

Estimates of the production of raw wool in the leading wool countries of the world, at different periods of the present century, together with an estimate of the number of sheep at the half-century, are given in the following table.*

	Production of wool in million lb. (greasy basis)					Million Sheep
	1900	1909-13	1934-38	1947-48	1950-51	1950-51
Australia . . . }	514	700	995	973	1,155	112.9
New Zealand . . }		198	300	362	372	33.9
Union of South Africa	46 ¹	158	261	215	240	31.9
Argentina . . . }	398	359	376	460	430	47.0
Uruguay . . . }		157	114	150	165	23.0
United States . .	301 ²	314	451	328	263	30.7
United Kingdom .	141	134	111	75	91	19.5
Russia (U.S.S.R.) .	—	320	219	250	320	80.0
World total . . .	2,025	3,187	3,788	3,784	3,945	717.0

¹ Cape of Good Hope only.

² North America.

The estimation of wool production on a greasy basis greatly modifies the value of the figures for comparative purposes. The wool on the sheep always includes a varying proportion of grease and dirt, which must be removed before the wool is ready for use. Each fibre of the wool has a natural covering of grease, which is known as the yolk, and which on the living animal has the important property of preventing the wool from becoming felted. Occasionally the wool is scoured before export, but this practice, which is apt to result in the felting of the wool when packed in bales for long voyages, is becoming rarer. More frequently the fleece is washed to get rid of the dirt, the yolk being still retained. Very often, however, the wool is exported in its natural condition. The amount of clean wool, that is, the amount of fibre available for manufacturing purposes, thus varies greatly according to the difference of practice in this respect, as well as according to other circumstances affecting the condition of the wool.

Of the world production of raw wool in 1950-51, as estimated in the foregoing table, it has been calculated that merino wools account for 1,400m. lb., crossbred wools for 1,726m. lb., carpet wools for 819m. lb. The predominant position of Australia among the world sources of supply stands out clearly in the table. Merino

* With acknowledgment to the Commonwealth Economic Committee's Report on "Industrial Fibres" (1952).

sheep were introduced into Australia about the close of the eighteenth century, and care has been taken to propagate them. They have thriven admirably, and certain parts of Victoria and New South Wales now produce a wool unequalled for softness and lustre, and at the same time, unlike the original merino, very long in staple. This wool now commands the highest price in the London market. As the merino sheep, however, yields very poor mutton, the growth of the trade in frozen lamb and mutton has led to the rearing of increasing numbers of sheep crossed with English breeds, yielding better mutton, and producing a different variety of wool. Crossbreds require plentiful pasture with a good rainfall, whereas merino sheep, though badly affected by drought, thrive best on light pastures with light rainfall.

Next to Australia, though far below it, is Argentina, and if Uruguay's production be added it will be seen that the La Plata region has an output equal to about half that of Australia. New Zealand comes third in the list. The United States, which had the second largest output before the Second World War, has since lost ground both actually and relatively, and has a considerable import, largely of carpet wools from India and Argentina, as well as of the finest types (from Britain). The Union of South Africa has a large output in relation to its population, and is not far behind the United States. The rearing of merinos has been fairly established there since about 1812, but the South African wool is neither so fine nor so long in the staple as that of Australia; until the outbreak of war in 1939 the chief markets for it were in continental Europe (France, Germany and Belgium). It is now the most valuable export from the Union, not excepting even gold.

For Australian, New Zealand, and the best South African wool the chief market was the United Kingdom, which derived from the Commonwealth and Argentina the great bulk of the wool required for the home manufacturers. Before the war, the different branches of the British woollen industry were making use of nearly eight times as much imported as home-grown wool; and of the total quantity of imported wool (including that which is re-exported) that of Australasian origin had averaged between 60 and 70 per cent. for over seventy years. As in Australia, large numbers of crossbred sheep have come to be reared in recent years in Argentina. A great deal of the best blood of British breeds has been introduced into the country, and the cross-bred wool of that country is now unsurpassed. The chief markets for the River Plate wool are the United Kingdom, Germany, the United States, France, Italy, and Belgium. Formerly River Plate wool was considered 'dirty' and went to continental Europe: this whole position has now changed.

In the latter part of last century London was almost the sole market for Australian wool, but now the bulk of the wool is sold

by auction in the chief Australian capitals. One result of this is that a large proportion of the wool from that part of the world is sent direct to New York and the principal Continental ports. Normally between 80 and 90 per cent. of the wool grown in Australia is sold in the local market prior to export. In 1895 only 50 per cent. was sold thus.

Apart from the main sources of supply, the United Kingdom draws considerable quantities of raw wool from India (whence the wool obtained is generally of poor quality, used chiefly for making carpets or blankets), France, Chile, and the Irish Republic.

Other wools. The principal animals besides the sheep yielding materials for the woollen manufacture are the **goat**, the **alpaca** and **vicuña**, and the **camel**. The fibre derived from all of these is more nearly allied to wool than to hair, though there are gradual transitions between the properties of the one and those of the other fibre.

Of the varieties of goat, those most famous for their wool are the **Angora goat** and the **Cashmere** (Kashmir) **goat**. The former is a native of the steppes of the interior of Asia Minor, and its wool, known as **mohair**, is remarkable for its length, fineness, softness, and silky appearance. The goat has been introduced with great success into **South Africa**, and mohair has long been an important export of the Union of South Africa. The **Cashmere goat** is the animal that furnishes most of the material for the costly Cashmere shawls, so called from having been first made in the kingdom of Cashmere or Kashmir. The material used in the manufacture is not the ordinary covering of the goat, but a fine downy under-covering which grows in winter on this and other animals (such as the yak) belonging to the higher slopes of the Himalayas.

The **alpaca** is an animal closely allied to the llama, and, like it, a native of the lofty plateaus of the Andes. It has long been domesticated for the sake of its wool, which is remarkably soft and elastic. This wool, though long used in spinning and weaving by the Peruvians, was at first found to be unsuited for spinning by the processes now used in the great manufacturing countries; but the difficulties in the way of its being so used were at last (about 1836) overcome by Mr. (afterwards Sir Titus) Salt, of Bradford, who thereby founded an important industry.

The wool of the **vicuña**, another ally of the llama and alpaca, is of even more value than that of the latter animal, but, since the vicuña is found only at elevations above 13,000 feet, it is not domesticated, and the supply of wool from this source is consequently small and decreasing.

Camel's hair, formerly used chiefly for making painters' brushes, is now employed in the manufacture of coarse shawls, carpets, blankets, and other fabrics, the yarn made from it being usually mixed, however, with other yarns. A fine and light-coloured camel-

hair is imported from China, a coarser and darker-coloured kind from Russia, and as this latter kind is very strong and does not readily stretch it is largely used in making belting for machinery.

WOOLLEN MANUFACTURES. In point of antiquity the origin of the spinning and weaving of wool belongs to the same remote period as the industry in cotton and linen. In point of extent the woollen industry is, in temperate countries at least, the great rival of the cotton industry, and in most of them is the more important of the two. In temperate and cold countries, in which close-fitting garments are worn, wool is much the most suitable material for clothing, not only because it is a bad conductor of heat (due largely to the large amount of air occluded), and woollen clothes consequently retain the heat better than others, but also because moisture is less readily absorbed by the woollen fibre, and perspiration more readily passes through woollen tissues than through tissues of another kind. Where, as in the tropics, and in warm countries generally, clothes are worn more loosely, this circumstance is of less consequence. It is natural, therefore, to find that in all temperate countries, except China and Japan, wool is the principal clothing material, and its use is further promoted by the fact that such countries also furnish the raw material of the manufacture.

The treatment of wool in manufactures is in many respects like that of cotton, but some differences require notice. First of all the wool has to be thoroughly freed from the yolk or natural grease which invests it, since that would prevent it from taking the dyes, and otherwise interfere with the processes which it has to undergo. Dyeing may follow, and then the fibres may be oiled artificially to make them more easily workable. The nature of the next steps depends upon the use to which the wool is to be put, or more particularly upon the kind of yarn that is to be made from it. Formerly all long-stapled wools were combed, or so treated that the fibres were laid as nearly as possible parallel to one another, and were then spun into a kind of yarn known as worsted, which is used in hosiery and in the manufacture of fabrics which have not to undergo the process of fulling. All short-stapled wools, on the other hand, were carded and spun much in the same way as cotton, and the yarns so made were the only ones capable of being used in making milled or fulled cloths, in which advantage is taken of the felting property in wool to thicken and shrink the cloth after weaving, and afterwards by means of teasels to raise the nap of the cloth in such a way that, in the most highly finished fabrics, a uniform surface is presented to view without any appearance of the intercrossing of fibres that takes place in weaving. All kinds of wool were therefore formerly divided into (*a*) combing, (*b*) carding or clothing wools, according to the purpose for which they were fitted. Machines have been invented capable of combing wools having a staple as short as

one inch, and, on the other hand, wools with a staple of as much as five inches long may be used in making milled cloth. Wools are still divided into combing and carding or clothing wools, but the former term is no longer synonymous with long-stapled, the latter with short-stapled wools, and the distinction as between wools is no longer so absolute as it once was. But the distinction between worsted yarns and carded or clothing yarns still holds good, and it is to the industry concerned with the latter that the term 'woollen manufacture' is specially applied.

Among the principal varieties of woollen cloth in the special sense of the term are: (1) broadcloths, so called from the great width of the web, the finest quality of cloth; (2) cashmeres, a fine thin twilled fabric, much used for ladies' dresses; (3) tweeds, a fabric of looser texture than broadcloth and less highly milled, first and still mostly made in Galashiels and other towns belonging to the Tweed basin, chiefly used for men's clothing; (4) doeskin, a strong twilled cloth also used for men's clothing. Blankets, flannels, Scotch bonnets, and some kinds of shawls also belong to the woollen manufacture in the special sense of the term.

The name worsted is said to be derived from the parish of Worstead in Norfolk, where a colony of Flemish weavers, who are credited with having introduced the manufacture of worsted into England, settled in the twelfth century. Merinos and serges are among the chief kinds of worsted fabrics made entirely of sheep's wool, but such fabrics are perhaps the exception among those in which worsted yarn is used, at least in the United Kingdom, this kind of yarn being mixed more frequently than carded yarn with yarns made from other materials. The fibres chiefly used for mixing with that of the sheep are mohair, alpaca, and camel's hair. Hosiery and the making of carpets may also be classed as departments of the worsted branch of the woollen industry, though the best carpets (Turkey, Brussels, Axminster, &c.) are made on a ground of strong linen or hemp, and only inferior kinds (such as Kidderminster, Scotch, &c.) entirely of wool. Artistic hand-made carpets are produced in Ireland, chiefly in Donegal, and still more valuable ones in Persia and other Eastern countries.

Besides woollen and worsted yarn another kind originally derived from wool is now employed in the woollen industry in the production of a coarse but cheap kind of woollen cloth. The raw material in this case is obtained by tearing up cast-off woollen clothing and woollen rags into fibres, which can be re-spun into a yarn, not very strong indeed, but capable of being woven. This material is known as shoddy when made from fragments of loose texture, and mungo when made from the remains of finer fragments, such as old dress-coats, tailors' clippings, and the like. This industry, besides using up all the available woollen rags of British production,

gave rise in England to a considerable import trade in rags of this nature.

In the Middle Ages woollen manufactures attained their highest development in Flanders, which had the advantage of being within easy reach of abundant supplies of wool, especially from England, and being able to send its manufactured products to the best markets by sea, river, and land. In the middle of the twelfth century Flemish woollens were already worn in France and Germany. A writer of the thirteenth century says that all the world was clothed in English wool wrought in Flanders. It was from Flanders that English kings at different times introduced artisans into England with the view of improving the woollen manufactures of their country. Towards the close of the eleventh century this was done by William the Conqueror; it was again done by Edward III in the first half of the fourteenth century, and again by Henry VII towards the close of the fifteenth.

England had already begun to export considerable quantities of woollen cloth in the sixteenth century, but the cloth was often, if not mostly, undressed and undyed, these finishing processes being performed in Holland as late as 1603, and for the finest fabrics down to the middle of that century. Early in the following century the woollen industry of England had risen to such importance that woollen manufactures formed upwards of 40 per cent. of the value of the exports, and about 1780 this industry is spoken of as having 'long been the glory of England and the envy of other nations.' Soon after that it began to share in the improvements brought about by the introduction of machinery into the cotton manufactures, but as the leading industrial countries of the world all produce quantities of woollen goods, the British woollen industry (in the wide sense of the term) never acquired the predominance attained by the British cotton manufactures. In 1921 the factories engaged in woollen, worsted, and shoddy manufactures in the United Kingdom employed about 237,000 persons, considerably less than half the number employed in the various branches of the cotton industry. Nearly half of these were employed in the woollen (including shoddy), the remainder in worsted factories. It is noteworthy, however, that native English wools are best adapted for the worsted industry, which helps to account for the fact that it is in this branch that England has long maintained a special reputation, as is shown by the export trade in woollen and worsted yarns; through all the fluctuations of the past hundred years, worsted yarns have been an easy first.

Exports of combed wool, made up into bundles known as tops, increased from 6.4m lb. in 1890 to over 50m. lb. before the Second World War, and though at the end of the war they were down to 16m. lb., they rose higher than ever, to 73m. lb., in 1950, dropping however to 50m. lb. in the trade recession of 1951.

British Exports in millions of lb.

Average of years.	Woollen yarn.	Worsted yarn.	Alpaca and mohair yarn.
1862-66 . . .	1.5	27.8	1.5
1906-10 . . .	2.7	55.4	16.3
1926-30 . . .	6.6	37.8	7.6
1936-38 . . .	6.6	25.8	3.9
1949-51 . . .	5.3	20.6	2.0

The predominance of worsteds in the export trade in yarns does not extend to the export trade in manufactured products, where worsted tissues have been far outstripped in the present century by woollen tissues, as shown in the following table.

British Exports in millions of square yards of woollens and worsteds, exclusive of blankets, carpets, flannels, druggets, &c. Listed in U.K. Trade Returns as 'Other Woollen Tissues' and 'Other Worsted Tissues'.

Average of years.	Woollen tissues.	Worsted tissues.
1857-61 . . .	25	134
1901-05 . . .	56	103
1911-13 . . .	101	71
1921-25 . . .	129	63
1931-35 . . .	62	32
1936-38 . . .	72	38
1945 . . .	28	13
1949-51 . . .	72	38

In certain parts of the European mainland it is now customary to have woollen yarns, as well as wool and woollen fabrics, 'conditioned'—that is, tested as to weight, measurement, and condition in recognised establishments for the purpose. The submission to this test is voluntary, but so general is the practice that at Roubaix, where there is one of the largest of these establishments, nearly all the yarn used in local factories is conditioned. A similar establishment was opened at Bradford, Yorkshire, in 1891, and is provided with ingenious testing apparatus partly due to local invention. It serves primarily to protect the buyer against an undue amount of moisture in the wool purchased.

SILK. Next to wool, silk is the most important of animal products used in weaving. The great bulk of the silk of commerce is derived from an animal called the **silkworm**, but which in reality is the caterpillar stage of a kind of moth, whose favourite and best food consists of the leaves of the white mulberry (*Morus alba*, L.). It is hence called *Bombyx mori*, or the mulberry bombyx. In the body of the silkworm the substance that becomes the silk fibre exists in the form of two jelly-like masses, which harden on exposure to the air. When the 'worm' is about to pass into the chrysalis stage, it sends out this substance by two minute openings at the head, and the two streams, at once uniting, form an extremely fine thread, which the worm coils round itself, so as to form what is called a cocoon. From the cocoons the silk of commerce is directly obtained, but the

thread of a single cocoon is much too fine for use in spinning and weaving, and hence in reeling off the fibre the threads from several cocoons are united, individual threads being sufficiently adhesive to make this an easy matter. For the finest qualities of silk fibre, the product of from five to seven cocoons is used; for coarser qualities, the product of eleven or twelve, or even twenty or more.

After being reeled off from the cocoons the silk is made up into hanks, and in this condition forms the raw silk of commerce. The outer husks of the cocoon and a part of the silk in the interior are incapable of being reeled off, and in addition to that, numerous fragments of thread remain as refuse after the process of reeling. These are exported from silk-producing countries under the names of husks, knubs, and waste, and such material is now largely employed in the manufacture of silk fabrics, especially in the United Kingdom. Cocoons also are exported, but generally in comparatively small quantity; for since 100 lb. of cocoons yield only about 9 lb. of raw silk, it is obvious that the carriage of the silk in the latter form must be much more economical than in the form of cocoons.

Since mulberry-leaves form the principal food of the silkworm, the animal can be reared in all climates in which the mulberry thrives. Silkworms are usually reared under cover, the trees being stripped of their leaves in order to supply them with food, and the animals can thus be protected from cold and other influences of the weather that might be injurious to them. The range of climate suitable for silkworm rearing is consequently a wide one. Still, the character of the climate is very important. The health and productiveness of the caterpillars are greatly affected by the temperature, and as the rearing of the insect from the egg to the formation of the cocoon is completed within seven weeks in spring, there are great fluctuations in the amount of raw silk produced, according as the weather is genial or not. In China the rearing of the 'worms' begins about the beginning of April, and the yield of silk is apt to be greatly diminished if during that month the temperature sinks much below 60° F. In Japan the 'autumn crop' free from the vagaries of spring is now as important as the spring crop. But the geographical distribution of raw silk production does not depend solely on climate. This industry is almost confined to the Old World, and indeed to Asia and Europe, notwithstanding that there are many regions elsewhere in which the climate is all that could be desired for the purpose. This limitation in the range of production arises from the nature of the labour connected with the industry. The tending of the silkworms previous to the spinning of the cocoons, and the subsequent operations necessary to prepare the raw silk for the market, demand not only a considerable amount of labour, but likewise the utmost carefulness and delicacy on the part of those employed. Silkworm-rearing is therefore generally confined to those

parts of the world in which the labourers are not only content with low wages, but have inherited from previous generations a capacity for watchfulness and delicate manipulation, and have been trained in these habits from a very early age. Thus the United States, though the largest manufacturer of silk goods in the world, is entirely dependent on imported raw silk.

Chinese history or legend ascribes to Si-ling-she the honour of having discovered the art of spinning and weaving silk about 2700 B.C. The rearing of the silkworm is generally distributed over **China**, but is principally carried on in the middle provinces (about latitude 30° to 35° N.), and in the southern province of Kwang-tung. In addition to the produce of the carefully reared and tended mulberry moth, there is a large amount of silk obtained in China from various other moths, and from the mulberry moth in a state of nature. It used to be reckoned that about one-fourth of the total production and one-tenth of the export came under the head of **wild and coarse silk**.

With no estimate of home consumption, it is difficult to assess China's present position among silk-producing countries, but its exports have been left far behind by those of **Japan**, which easily dominates world trade in silk. The production of raw silk in Japan was subject to greater fluctuations than in China, a natural consequence of its more northerly latitude and greater liability to cold springs, until the development of the autumn crop. The Japanese have readily adopted European inventions and the bulk of the silk is reeled not by hand but in steam filatures. There has been similar development in China, at least as regards the export trade. Whereas in 1894 China's exports of filature silk were only about 5 per cent. of her exports of hand-reeled silk, mid-way between the two World Wars most if not all of the exports were filature silk.

In **India** the rearing of the mulberry silkworm appears to have been introduced as early as the sixth century of our era, but the industry is far from having attained the importance which it possesses in China and Japan. The mulberry is chiefly cultivated in Bengal, where the East India Company made special efforts to foster the production of silk as far back as 1767, and Bengal silk became an important article of export. But nowadays, the export of raw silk has fallen normally to a small fraction of the import, and Mysore provides a large proportion of India's output of cocoons. Considerable quantities of silk are obtained from other moths, one or two species of which are sometimes domesticated, though for the most part they are left to themselves. These 'wild' moths are principally found in Assam, the old Central Provinces, and the more sparsely peopled region in the west of Bengal. The general name of tussore silk is given to their produce, and most of the silk so called is distinguished by its natural fawn colour. Wild silk, chiefly derived from

various species of *Anaphe*, is also produced in different parts of Africa.

The export of silk from **Indo-China** is quite insignificant, though there must be a large local production. More important has been the export from **Persia (Iran)**, where the rearing of the silkworm, now principally carried on in the narrow strip between the Elburz Mountains and the Caspian, is said to have been introduced about the same time as it was into India. Of other Asiatic seats of silkworm-rearing the principal are Trans-Caucasia, Asia Minor, and Syria.

In the early days of the Roman Empire silk had already come into use in Europe as a material for garments worn by the rich, and before the commencement of the Christian era the raw material had been imported into Italy, where it was woven into tissues. But it was not till the sixth century A.D. that Europe was able to make a beginning with the rearing of silkworms. Justinian, who was at that time emperor of the East, and his consort, Theodora, encouraged the new branch of agriculture, of which **Greece**, and more particularly the Peloponnesus, became the principal seat. The peninsula just named is said to have obtained its modern name of Morea from the Greek word for a mulberry-tree. Silkworms were also introduced by the Arabs into **Sicily** and **Spain**, and during the Arab (Moorish) domination in southern Spain the production of silk was very extensively pursued. It is still carried on in Murcia and Valencia in Spain, in various parts of Greece, and in other parts of the Balkan Peninsula; but in the five years 1934-38 the total estimated production of all these regions, measured by the weight of cocoons produced, was only about one-fifth of that of Italy, which provided 80 per cent. of the silk produced in Europe. And now, in Italy, the great silk-producing region is not the island into which the silkworm was first introduced, but the great plains of the north, Lombardy, Piedmont, and Venetia, in many parts of which the long rows of mulberry-trees, stripped bare of their leaves in summer, are a spectacular reminder of the nature of the industry pursued there.

Nowadays **France** ranks below not only Italy but Greece and Bulgaria in the weight of cocoons it produces, though in the middle of the nineteenth century its production of silk—chiefly associated with the Rhône valley—exceeded the Italian production. In 1856 the business of silkworm-rearing in France began to be adversely affected by the outbreak of a disease among the worms; and the ravages of this disease, which at a later date spread to Italy, Spain, Greece, and even the silk-countries of the Far East, were such as to bring down the silk-production in France in 1876 to less than a tenth of what it was in 1853. After 1876, matters improved, chiefly in consequence of an important service rendered to the industry by science. The distinguished French chemist Pasteur, being appointed by the French government to inquire into the

nature and origin of this disease, discovered that by examining the moths with the aid of the microscope it was possible to distinguish those which laid healthy eggs. Since then the microscope has been recognised as an indispensable instrument in the rearing of silkworms. Each moth is caused to lay its eggs on a separate piece of linen in a corner of which the moth is afterwards wrapped. If afterwards the moth is found to show signs of disease the eggs are destroyed. While France has been able thereby to check the ravages of the disease, other countries which received it later have had the means of checking its spread at an earlier stage.

World production of raw silk in 1938 (exports only in the case of China) was estimated at 121m. lb. (about 54,000 tons). Japan provided nearly 80 per cent. (95m. lb.) of this total, and was followed by China (7m. lb.—sea-borne trade only), Italy (5·4m. lb.), Korea (4·7m. lb.), U.S.S.R. (4m. lb.), and India (2m. lb.). Faced with the competition of rayon fabrics and, later, nylon hosiery, the output of raw silk had been declining for some years, and the Second World War had a disastrous effect on the industry. Mulberry trees had to give place to food crops, and any hope that the development of aviation would provide a reserved market for silk, for the manufacture of parachutes, was disappointed: nylon proved to have a greater tensile strength. For the rest, with all its many and admirable qualities, silk is mainly a luxury product, and by the end of the war the annual output had dropped to 24m. lb.—one-fifth of the 1938 figure.

Since the War there has been some revival of industry and trade in silk, but it has been subject to sharp fluctuations. Italian exports, which rose to nearly 4m. lb. in 1946, were down to 0·9m. lb. in 1949, and 1·3m. lb. in 1950. World production in 1949 was reckoned at 36m. lb., but dropped in 1950 to 33m. lb.—little more than one-fourth of the pre-war figure. Japan's output was down to less than 20m. lb., which, however, was 60 per cent. of the total; Russia was credited with nearly 4m. lb., Italy provided about 3m. lb., India reported 2·3m. lb., and Korea 1·6m. lb. It was anticipated that in 1951 the total output might amount to one-third of the pre-war production. Already Russia's output was said to compare favourably with the pre-war standard. It was reported that the mulberry acreage had been extended in Uzbekistan, the chief producing area, and that better-yielding cocoons had been developed.

Exports of raw silk from the producing countries, which before the Second World War averaged some 92m. lb. a year, had dwindled in 1950 to 14·8m. lb., of which Japan supplied 12·7m. lb., and Italy 1·3m. lb. The United States was still the best market, but on a greatly reduced scale, even proportionately. Whereas in 1938 it absorbed 84 per cent. of the Japanese exports, in 1950 it took less than half the very much smaller quantity available. Japan's other

customers were chiefly France, the United Kingdom, and Switzerland. Italy, having practically lost the American market, disposed of her raw silk exports to Germany, Switzerland, France, and the United Kingdom; while China's latest-known markets (in 1948) were Burma, Russia, Germany and the United States.

SILK MANUFACTURES. The silk fibre as it is wound from the cocoon, being a continuous thread, does not require to go through the processes necessary in spinning wool, cotton, and other fibres. The making of true silk yarn is known as **throwing**, and consists merely in giving the fibre a slight twist, which enables it to combine better with other fibres. For stronger fabrics several fibres of raw silk are united, being twisted into a fine cord. The processes undergone by silk waste to convert it into yarn are essentially the same as those adopted in spinning the other fibres mentioned above. The yarn so made is distinguished as spun silk from the thrown silk made by the other process.

Of the specially named fabrics made from silk, the chief are satins and velvets, the former being tissues so woven that almost the only threads appearing on the outer or 'right' side of the tissue are weft threads, which present a uniform glossy surface; the latter, tissues in which the outer surface presents to view a short soft pile, made by passing the warp threads over fine wires, which are afterwards drawn out. The loops then remaining are either left as they are, in which case the tissue is called pile velvet, or cut to form cut velvet. This fabric is now imitated in cotton and mixed tissues.

Though Italy was one of the earliest seats of the silk manufacture in Europe, and though during the Middle Ages this branch of industry developed to a high pitch in Venice, Lucca, Genoa, Bologna, and other Italian towns; though, too, that country, as we have seen, stands far ahead of all others in Europe in the production of the raw material, in the manufacture of silk fabrics it ranks far behind France, and its silk is exported largely in the form of thrown silk. The higher branches of the silk industry are now, however, more important than at the end of last century.

In silk manufactures **France now surpasses all other countries in Europe.** The centre of the industry in France is Lyons, and the history of the industry in Lyons and the regions around offers some very interesting illustrations of the influence of political events, of inventions, and of fashion on the prosperity of manufactures, and the commerce depending upon manufactures. The silk industry of Lyons began to flourish after the capture of Milan by Francis I of France in 1515, that monarch having then induced several silk artisans of Milan to settle in Lyons. Encouraged by that monarch, and at a later date by Henry VI, and favoured by the extension of silkworm-rearing in the valley to which Lyons belongs, the industry rapidly rose to a position of great importance, and the first blow inflicted upon it was

due to the persecution by later French kings of the Huguenots, or French Protestants—a persecution which drove many of the French silk-workers out of France, and sowed the seeds of the industry in many other parts of Europe, even in Russia. From this blow, however, the French industry revived, and about the beginning of the nineteenth century it received a great impetus from the invention in Lyons of the celebrated apparatus named, after its inventor, the Jacquard loom for the weaving of figured patterns.

Originally invented for use in the making of silks, in which tasteful patterns greatly enhanced the value of tissues worn only or chiefly by the rich, this apparatus has since been applied to looms constructed for the weaving of other fabrics (linen, &c.); but its principal application is still probably in the silk industry, to the development of which, especially in France, it has greatly contributed. When the sewing-machine came into general use, fashions of ladies' dresses became more elaborate and more changeable, so that there has been much less demand for the fine and costly but lasting tissues which used to be the glory of the French looms. Silks of an inferior and less durable quality, and mixed fabrics having the appearance of silk, were sought after; and since the looms of Germany and Switzerland were more speedily adapted to meet the wants of this new taste, the French industry suffered greatly in the competition. Subsequently, however, the French manufacturers adapted themselves to the new requirements of the trade. The competition of the cheap Japanese silks has beat all producers, and since the First World War the great competitor has been "artificial silk", or rayon—a name which in British trade parlance covers all textile fibres not of natural origin, including nylon (see p. 309). None the less, before the Second World War the rising standard of living throughout the world was leading to increased use of real silk as well as of the competitive synthetic fibres.

The **German silk industry** is associated more or less with all the manufacturing regions of the country; but Krefeld is the town most completely identified with this branch of manufacture. In **Switzerland**, Zürich and Basel are the chief seats of the manufacture. At Lyons, Krefeld, and elsewhere, there are **conditioning** houses for silk, similar to those for wool mentioned on p. 162.

In the **United Kingdom** the silk manufacture is not so highly developed as the other branches of the textile industries, and in the silk industry proper—that is, the industry in which thrown silk as distinguished from yarns spun from silk waste is employed, a great decline has taken place since the latter part of the nineteenth century. Of this decline there are several explanations. In the first place, the British Isles have not the advantage, like the chief silk-manufacturing countries of the Continent, of being able to produce any of the raw material as an article of commerce. More-

over, since the opening of the Suez Canal it has become less of a market for Eastern silk. The industry has thus developed with more vigour in some of the regions in which the supplies of the raw material were more ready to hand; and when the duty on silks in this country was abolished, under the treaty with France in 1860, the British manufacturers found themselves completely beaten, even in the home market, by those of France. On the other hand, in the years between the two world wars the silk industry, hand in hand with rayon manufactures, made great strides in the United Kingdom. The chief centre of silk manufacture and of certain styles of rayon is the district embracing Macclesfield (Cheshire) and Leek (Staffordshire). Lancashire and Yorkshire have also won fresh fame by their rayon fabrics, and these counties are the seat of the spinning of silk waste and the weaving of 'spun' or schappe silk.

Under the protection of a high duty, the silk manufacture has advanced with rapid strides in the United States, which now surpasses France in this industry. The chief seat of the manufacture is Paterson, in New Jersey, within fifteen miles of New York. The great Japanese industry is associated especially with the heart of the country; production and spinning are carried on in the numerous small basins, weaving is especially important at Kanazawa, and Kobe and Yokohama are the great commercial centres and ports.

COMMODITIES (*continued*)

1.—B. *Sub-tropical Products*

COTTON. Cotton consists of the tufts of woolly fibres which envelope the seeds of a shrubby plant. When the seed-vessel has opened, the tuft swells out to the size of an apple, and remains for a time firmly held by some of the withered parts of the plant, which partly close in upon it, but remain open enough for the cotton to be easily picked. The seeds are of about the size of small peas slightly flattened. Of all the products of a sub-tropical climate cotton is commercially the most important, and its importance dates back to the earliest times of which there is any record. The first mention of it is found in Indian books written more than eight hundred years before the Christian era. The first European writer who is known to have mentioned it is Herodotus, who wrote in the fifth century B.C., and speaks of a tree which he knew by repute as growing in India, and bearing instead of fruit a wool like that of sheep.¹

The wide diffusion of the plant in prehistoric times is even more remarkable. While most of the chief cereals, along with flax and hemp, were introduced from the Old World into the New, and the New World gave to the Old maize, tobacco, and the potato, cotton was found by the earliest explorers, from Columbus to Cook, growing almost everywhere in the area in which it is now found.

At the present day its cultivation is almost universal in tropical and sub-tropical regions, but it is in the latter that it attains its widest extent. The United States, India and Pakistan, Egypt, and Brazil are the most important countries of production so far as international commerce is concerned; Russia and China are large producers of cotton for home consumption, and occasional factors in the export trade. In all these countries except India and Brazil, the districts where cotton is chiefly grown lie outside of the tropics, and in India, the cotton districts, though mainly tropical, are generally at least one thousand, and in some places two thousand feet or more above sea-level. Its northern limit in the New World is about 37° N.; in the Old World it is largely grown in Russian Turkestan to the north of 40° and even, in Chinese Turkestan, in the oasis of Turfan

¹ One cotton-plant, probably *Gossypium arboreum*, was certainly known at a very remote date in Egypt. See Parlatore, *Le specie dei cotonei*, p. 16.

between 42° and 43° N., but this is at a level below that of the sea.

The world acreage under cotton reached a new peak in 1937-38, with an estimated total of 93m. acres, yielding 18,000m. lb. The half-dozen or so leading countries mentioned in the last paragraph accounted for over 90 per cent. of both acreage and production. During the Second World War, the growing importance of food production led to a big decline in the acreage devoted to cotton, which reached a low level of under 54m. acres at the end of the war, with a low level production of 10,000m. lb. (1945-46). So far (1952) recovery has not reached the pre-war figures, but in 1949-50 the area under cotton approached 70m. acres and the production exceeded 15,000m. lb. Official restriction of the area planted in the United States—the dominating factor in world supply—was largely responsible for a setback in the following year. With the removal of these restrictions in 1951-52 and the extension of cultivation in other countries, a bumper crop was anticipated, and though drought disappointed some of the hopes, a world output of over 17,000m. lb. was realised.

The cotton-plant is not everywhere precisely the same. The genus *Gossypium*, to which all the cotton-plants properly so called are referred by botanists, is a genus containing several species which differ in size, in the colour of their flowers, and, what is most important from a commercial point of view, in the length, strength, and fineness of the fibre forming the tufts.

All the cultivated varieties are now believed to be reducible to three species—*G. herbaceum*, Linn., and *G. arboreum*, Linn., both believed to be natives of the Old World, and *G. barbadense*, Linn., believed to be a native of the New World. The species now most widely cultivated, both in the Old World and the New, is *G. herbaceum*, for the *G. hirsutum*, Linn., the species to which the ordinary American 'uplands' cotton used to be referred, is now regarded as a mere variety of that species. It grows to the height of about four or five feet, and produces a soft and silky wool composed of fibres of moderate length, that is, from nine-tenths of an inch to an inch and a third long. It is a native of India, Indo-China, and the Eastern Archipelago, and has been introduced into all other parts of the world with a suitable climate—into the United States some time in the latter part of the eighteenth century. There it succeeds better than in its original home, yielding on an average a fibre of about one inch in length, as against one of about nine-tenths of an inch in India, and whereas cotton grown from Indian seed improves in the United States, that grown from American seed degenerates in India. It is the product of this species, as cultivated in the United States, that is generally known in the European markets simply as American cotton. The best of all cotton, however, is

that derived from *G. barbadense*, and known as **Sea Island cotton**, from the fact that in the United States it was first cultivated on the string of flat islands which line the coast of Georgia and South Carolina. It is that which produces the cotton with the finest quality of 'staple' as it is called—in other words, that which has the longest, finest, and strongest fibres, and which in the mass has the most beautiful appearance. The length of the staple in this species may be as much as two and a half inches, though the mean length is said to be only 1·6 inches. If allowed to grow on from year to year this species of cotton may attain the height of from fifteen to twenty feet; but being, like other species of cotton, cultivated mostly as an annual, it is seldom allowed to grow to a greater height than two or three feet. The colour of its flowers is yellow. This species appears to thrive best on a slightly saline soil and where there are saline ingredients in the atmosphere, and to require a greater amount of moisture and a longer period in which to mature than the ordinary species. It is still cultivated on the islands from which it takes its name, as well as in the northern parts of Florida, and has been successfully introduced into the Leeward Islands, Egypt, Tahiti, the Fiji Islands, and Queensland. A tree cotton known as **caravonica cotton**, said to be a hybrid between Sea Island and rough Peruvian cotton, has been grown for a considerable number of years in tropical Queensland, and has been introduced into other parts of the tropics. Its fibre is of long staple, strong and moderately rough, and as the plant has to be resown only every eight or nine years, its cultivation is recommended by the small amount of labour involved.

As regards climate, all the species of cotton-plant require for their successful cultivation a long summer free from frost, and with a moderate but not excessive amount of moisture. The cotton-plant is generally reckoned among those which prefer a dry warm soil, but it will put up with considerable differences in soil under diverse climatic conditions. To frost it is peculiarly sensitive; and as it generally requires about seven months or 200 frostless days to yield a paying crop, this fact alone has a great influence on the extent of its domain. Very equable, warm, but not excessive temperatures, especially during the period of most vigorous growth, appear to be those most favourable to the plant, and plenty of bright sunshine seems to be absolutely essential to the production of fibre of good quality.

In the **United States**, which grows from 40 to 50 per cent. of the world's cotton, the cotton-plant is for the most part confined to the south-east. At the date of the census report of 1880 there was little cotton grown to the west of 99° W., and little to the north of 37° N. It is still true that the bulk of the cotton crop is grown to the east of 99° W., but changing conditions in the interval have

altered both the extent and the pattern of the cotton lands very appreciably. Before the war of 1861–65 South Carolina produced about one half the total cotton crop of the United States and Georgia about one-fourth; in 1949 the two together produced about one-fourteenth of the total. In 1880 Texas, which itself extends up to and beyond the 99th meridian, was already among the leading cotton states; in 1949 it easily headed the list, with 37 per cent. of the total—between three and four times as much as the next largest crop (Arkansas). Also in 1949, three states still further west, New Mexico, Arizona, and California, provided between them $12\frac{1}{2}$ per cent. of the total; California (8 per cent.) ranking fourth among the cotton-growing states of the Union.

Pests are a big trouble. In 1892 the cotton-boll weevil entered Texas from Mexico and spread eastwards and northwards until it had ravaged the greater part of the cotton belt. Hence there have been great changes in the areas of maximum yield. The cotton belt is that in which summer rains prevail; but the areas of greatest production are at a considerable distance from the sea-coast, the rainfall in the maritime strips, including Florida, being generally excessive for this crop, except for soils of the lightest character. The mean temperature during the months in which the plant is most rapidly growing and maturing its produce—June, July, and August—is remarkably uniform throughout this region, that of June varying in different parts from 74° to 81° F., July 75° to 84° F., and August 75° to 84° F. Cloudless days occur during June and July in the ratio of about 1 in 4 in the more maritime and easterly parts of this region, in the ratio of 1 in 3 in the more inland and westerly, and in later months more frequently.

The total area of the 'cotton belt' of the United States is estimated at 700,000 square miles (448m. acres). In the last two decades of the nineteenth century, the area actually under cotton nearly doubled—roughly from 13m. to 25m. acres. In the first two decades of the present century it increased to 37m. acres, and in 1926 reached a peak of 46m. acres, with a yield of over 9,000m. lb. In 1937–38, though the acreage was down to 34m. acres, the yield was again over 9,000m. lb. (half the world production), but during the Second World War food crops in the United States, as in most other countries, took the place of cotton to such an extent that at the close, in 1945–6, both acreage and production were reduced to half the 1937–38 figures. Since then, as already noted, there has been a considerable measure of recovery. The area harvested in 1949 was over 27m. acres, producing just over 8,000m. lb.

Yields fluctuate. The belts of greatest relative production are the Mississippi 'bottoms', or strips liable to occasional inundations on the left bank of the Mississippi from Memphis to Vicksburg, and the 'black belt of Alabama', which runs from east to west across that

state, somewhat to the north of its middle line. In this belt the use of manure for cotton was considered, till the latter years of the nineteenth century, quite unnecessary, and yet the yield was at least twice as great as the average of the United States generally. There is a similar 'black prairie' region in the heart of Texas.

The annual average yield throughout the cotton belt has much increased in the last few decades. What used to be a maximum, enjoyed only in the best years, has become practically a minimum. Whereas the average used to range from about 170 to 225 lb. per acre, in the years 1937-38 to 1950-51 it ranged between 222 and 311 lb. per acre.

On the uplands and the Mississippi 'bottoms,' where cotton is chiefly grown, the soil is generally rich in lime; and it is found that the extent of this branch of cultivation and the productiveness of the plant tend to increase, other things being equal, in proportion to the abundance of this constituent of the soil.

Throughout the United States cotton is, or was, generally planted in rows, the individual plants fairly wide apart to allow of cleaning the crop. In slave times this was done by means of the hoe, but now mule cultivators have come into universal use. In all the moister parts at least, the earth is ridged up at both sides about the roots to facilitate the escape of any excess of moisture. In latter years, however, the practice of thick sowing has been introduced, with the result of an increase of 30 per cent. in the yield. To a rather dry climate the cotton-plant has a certain power of adapting itself, yet an unusually dry season always involves a short crop, as an unduly wet one leads to a crop large in amount but deficient in quality. Among other things that have to be attended to in careful cotton cultivation is, as in all other cases, the selection of the seed; and, second, the treatment of the plant in such a manner that the fruit, and consequently the cotton-lint, is produced in greatest abundance. Hence the bush is not allowed to grow too luxuriantly, but is prevented from producing too much leafage and stalk by pruning, and where necessary by topping, that is, removing an inch or two from the end of the stem. The time of sowing in the United States is the end of March or some time in April; the time of picking, from August to the end of the year, or, in the absence of frost, even later. Picking is done by hand, and is the most expensive operation in cotton-production. It is light work, however, in which women and children can be employed. One picker will pick on the average 100 lb. of seed-cotton per day.

The use of manures in cotton-growing in the United States began in the older cotton states, above all in Georgia and the Carolinas after the civil war of 1861-65, and has been gradually spreading ever since. Investigation has shown that the plant is one of those which in ordinary circumstances rewards the outlay on

fertilisers most generously, and that it is chiefly ignorance and custom that prevent an even wider adoption of a more advanced system of agriculture. And in connection with this subject there is one fact of the highest importance to remember, namely, that the commodity of greatest commercial value furnished by the cotton-plant is one that takes away from the soil comparatively little of its fertilising ingredients; so that if everything else were regularly returned to the soil, cotton, instead of being one of the most exhausting of crops, would be one of the least exhausting. It is the seed that withdraws from the soil most of the important constituents, potash and phosphoric acid; so much so that the removal of one crop of cotton-seed impoverishes the soil to the same extent as the removal of ten crops of cotton wool. Now it is an important fact that, though the oil derived from cotton-seed is an article of great commercial value, the cake that remains after the expression of the oil contains most of the fertilising constituents of the seeds; and it would appear that cotton oil-cake is one of the cheapest fertilisers which could be obtained in America. The cake may be used as manure either directly or by giving it as food to animals kept in cotton fields.

In **India and Pakistan** the mode of cultivating cotton presents some curious and interesting contrasts with the practice in America. The period of the year during which it is grown is the same, since it is dependent on the rains of the south-west monsoon. But in the region of India where cotton is principally grown on a large scale, a region lying mainly on the peninsular plateau behind the Western Ghats, which drain the rain-clouds of most of their moisture, the total rainfall is often in some parts rather scanty. Beyond this region cotton is grown, in extra-tropical India (using the name in its old sense), chiefly in the United Provinces and the Punjab, where the rainfall is even scantier, but where there are extensive areas under irrigation. As regards temperature, the chief cotton-growing region of India differs from that of the United States in having the higher temperatures in early summer and apparently in having a smaller proportion of bright weather. In the following data, furnished for comparison (*cf.* p. 173), Akola may be taken as typical of Berar, and Belgaum as typical of southern Bombay:—

		May.	June.	July.	August.
Akola, 930 ft.	{ Mean temp. F.	93°	86°	80°	79°
	{ Percentage of cloud	19	62	85	80
Belgaum, 2,550 ft.	{ Mean temp. F.	80°	74°	71°	70°
	{ Percentage of cloud	34	77	88	85

On the table-land of India the scantiness of the rainfall is made up for by the peculiar character of the soil, which, from its colour and from its being so admirably adapted for the growth of native cotton, is generally known as the black cotton-soil. It is derived from the decomposition of the basaltic rocks which cover so large

a portion of the peninsular area of India. It is of great fertility, and is said to have borne crops for thousands of years without manure. In one respect this soil agrees with the best soils of the American cotton region, namely, in the presence of lime. But the characteristic which renders it of such peculiar value in a region with so dry a climate is its remarkable tenacity of moisture. Instead of allowing the rain to sink away like the best cotton-soils of America, it becomes during the rains a tenacious mud. In dry weather the whole surface of the ground where this soil occurs becomes seamed with inter-ramifying cracks, between which the soil forms hard lumps, but these lumps still retain water imprisoned in their spongy cells. Hence, wherever this soil prevails irrigation is not required for cotton-culture.

The yield per acre of cotton in India and Pakistan is generally much less than in the United States, but is considerably higher in Pakistan than in India. In the four years 1947-48 to 1950-51 it ranged from 66 to 85 lb. per acre in India, and from 141 to 168 lb. per acre in Pakistan. Generally, though not uniformly, the better cottons have a prolonged period of growth. In those parts of India in which cotton cultivation is dependent on the summer rains, cotton cannot be sown till after the beginning of June, and growth is stopped by winter frosts in the north and on the black soils of the northern part of the table-land by the tearing of the roots through the cracking of the soil in the latter part of October. In southern Gujarat, east of the Gulf of Cambay, where some of the best native Indian cotton is grown, the picking does not begin till February. In southern Bombay, round Dharwar, sowing does not begin till August, and the picking goes on in March and April. In India manure is less used than in the United States. The staple of Indian cotton is generally short, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch, as against one inch or more for the ordinary American cottons, and this renders it unsuitable for many of the branches of the manufacture carried on in Lancashire. Picking is done by women who pick about 45 lb. per day.

During the present century, while the quality of Indian cotton generally has been greatly improved, there has been considerable extension of the area under cotton, especially through irrigation in the north as well as in the old Central Provinces, and there has been an increase in cotton of good quality in the extreme south of the peninsula; though the Second World War, as elsewhere, caused a big setback in both acreage and production. About 1906 a variety of cotton known as Cambodia cotton was introduced from Indo-China and has proved well suited to the red soils east of the Cardamom Hills, when irrigated and heavily manured. The cotton, having a staple of one inch in length, is capable of being used as a substitute for American cotton, and this fact, together with its high yield of 200 lb. per acre, caused its cultivation to be eagerly taken up there.

Large quantities of the long staple American cottons are now grown in the irrigated lands of Northern India and Pakistan (Punjab and Uttar Pradesh), though the best types of American cotton deteriorate when grown there.

In Egypt cotton cultivation is necessarily confined to the areas of perennial irrigation. The rich soil gives a higher average return than even the United States, the annual yield in the years 1937-38 to 1950-51 ranging from 392 to 580 lb. per acre. The staple is from 1·2 to 1·5 inches and the cotton is the best grown on a large scale; before the Second World War it fetched 50 per cent. more than the average of American cotton and twice that of Indian. After the war, Egyptian still headed the price list of cotton in large supply, but though in July 1947 it was treble the pre-war price, both American and Indian approached it more nearly in value than before the war. In recent years much of the production has been of the sakel or sakellaridis type with a staple of $1\frac{1}{4}$ to $1\frac{3}{4}$ inches. This high quality is no doubt to be ascribed to the fertility of the soil, and partly to climatic conditions. The skies are mostly bright, and the temperature rises and falls during the period of growth with remarkable regularity, as is shown by the following figures showing the mean temperature at Cairo from March to October:—

	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.
Temp. F. . .	62°	71°	79°	84°	85°	84°	79°	74°

Egyptian cotton is sown in March or April, and the first picking, which is the best, takes place in September. The picking is done by boys and girls, who pick about 30 lb. a day. The combination of conditions met with in the Egyptian delta seems not to be found elsewhere. Egyptian cotton has been tried in Sind, where the climate is sufficiently bright and dry, but the quality there grown is inferior, probably in consequence of the high temperatures of the earlier part of the season. The excessive heat of Upper Egypt has been found to be prejudicial to the strength of the fibre grown there. Egyptian cotton has also been tried in Texas, but though the temperature curves of some parts of Texas (as at San Antonio) are wonderfully close to that of Cairo, in those parts the climate is not equally bright and dry. On a small scale Egyptian cotton has been grown under irrigation with fair success at Phoenix, Arizona, and in a few other parts of the arid region in the south-west of the United States, but less than 1 per cent. of the crop is of this type.

Cotton is a striking example of the changes which time often brings in the world pattern of an important commodity, as regards its sources of supply and commercial distribution. During the period 1786-90 the British West Indies furnished more than 70 per cent., the Mediterranean countries 20 per cent., and Brazil about 8 per cent. of the imports of raw cotton into the United Kingdom; the share of the

United States and India together was under 1 per cent., and Egypt contributed nothing at all to the import from the Mediterranean. A hundred years later, in 1886-88, when the import had increased seventy-fold, from about 25m. lb. to 1,750m. lb., the share of the United States had risen to 75 per cent., that of India to 12 per cent. and that of Egypt to $9\frac{1}{2}$ per cent., while the share of Brazil had sunk to $2\frac{3}{4}$ per cent., and that of the British West Indies to insignificance. Fifty years later still, before the Second World War, the average annual import of raw cotton into the United Kingdom in the quinquennium 1934-38 was down to 1,390m. lb., and the United States' share of the smaller total had dropped to 41 per cent.; but Egypt's share was up to 20 per cent., and India's was 12 per cent., these three countries between them supplying 75 per cent. of the total. Brazil had come to the fore again, with an average of 8 per cent., and Peru supplied 6 per cent., the balance of 11 per cent. being provided mostly by the Anglo-Egyptian Sudan (5 per cent.) and by British African colonies and protectorates. The British Cotton-Growing Association (founded at the beginning of the century) and the Empire Cotton-Growing Corporation (incorporated in 1921 with a Government grant of £1m. and the right to levy funds on the industry) have lavished both zeal and money on the encouragement of cotton-growing in Colonial territories, with some positive increase in production but little percentage addition to normal world supplies. Apart from the Anglo-Egyptian Sudan, where the Gezira irrigation scheme has been a great success, cotton-growing has become the dominant industry in Uganda.

The decline in world production as a result of the Second World War was naturally reflected in the movement of trade. By 1947 the imports of raw cotton into the United Kingdom were down to 714m. lb.—little more than half the pre-war average; but both in 1949 and in 1950 they increased to over 1,000m. lb. In both those years the United States retained its wonted place at the head of the list of supplying countries, providing 40 per cent. of the 1949 total and nearly 30 per cent. of the 1950 total; but the position was rendered unstable not only by the general difficulties attendant on post-war trading, but particularly by the British Government's buying policy arising from the dollar shortage. Already in 1946 the United States had fallen to third place, with imports into the United Kingdom of only 116m. lb. (14 per cent. of the total), and in the first half of 1951, further tightening-up of British dollar expenditure reduced the United Kingdom imports of raw cotton from the States to a mere 31m. lb. (6 per cent. of the half-year's total). During these years, Egypt and Brazil vied with one another for first, second, or third place in the list, while within the Commonwealth the Anglo-Egyptian Sudan, Uganda, Nigeria, and Pakistan were the leading sources of supply, though in all cases the supplies were very variable.

It is to commerce alone that we owe the extraordinary development of the cotton production in the United States and Egypt, and the great extension of this branch of cultivation in India. Of the cotton grown in Egypt almost the whole is exported to Europe. Indian cotton is also exported, although a large proportion is now used in home mills, and even yet Georgia and North and South Carolina are the only states of the Union which consume a large proportion of the cotton they grow—the manufacturing areas being mainly in the north-eastern states.

The form in which the cotton is exported is that of bales, or large bundles of cleaned cotton, that is, cotton-wool freed from its seed by a process called ginning; and it is an interesting fact, illustrative of the variety of circumstances that affect the development of commerce, that the early extension of cotton-production in the United States was due to the invention of an improved process for effecting this purpose. Previously the process of getting rid of the seed was a laborious one, and hence one that demanded on economic grounds the cheapest available labour; and in 1792 so little was it thought probable that the United States would ever grow any considerable quantity of cotton, that, in negotiating a treaty with Great Britain in that year, the United States ambassador agreed to a provision (struck out, however, by the senate) which forbade the export of cotton from the United States to this country. In 1793 the invention of the saw-gin by Eli Whitney (an invention since then greatly improved upon) imparted such a stimulus to the cultivation of cotton in the United States that that country rapidly became the chief source of supply of raw cotton in the world. The growth of cotton in India and Egypt received a great impetus from the scarcity of the raw material due to the civil war in America in 1861–65, and the effects of that impetus were permanent in both countries.

Inventions by which the process of manufacturing cotton were cheapened have likewise been, as is well known, among the chief causes that contributed to the vast development of the commerce in this commodity in various forms; and it is a fact of great consequence in the history of British commerce that all the more important of these inventions originated in England.

COTTON MANUFACTURES. The early history of the cotton manufacture in Europe is far from being fully known. The Arabs are said to have introduced the cultivation of the plant into Spain in the eighth century. It is an ascertained fact that in the middle of the following century cotton manufactures on a considerable scale were carried on in the Moorish towns of Cordoba, Granada, and Seville. It is no doubt to this fact that cotton owes its name, which is of Arabic origin. Augsburg is known to have exported cotton fabrics of its own manufacture in the fourteenth century.

The first recorded importation of cotton into England was in 1298, for the making of candle-wicks (a manufacture, it must be remembered, of much greater relative importance in days when candles were the chief means of artificial lighting than now). In 1352 we find the first mention of Manchester cottons, but the fabrics so called were not what we know as cottons. Even as late as the seventeenth century a coarse kind of woollen cloth, a web of frieze, was known as cotton (Manchester, Kendal, and Welsh cottons of this kind are all mentioned), and the *New English Dictionary* expresses a doubt as to whether the term in this sense is of the same origin as the word in its present meaning. Later the term appears to have been applied to mixtures of wool and cotton or linen and cotton. That true cotton was used in Lancashire about 1640 appears from the fact that about that date there is mention of Manchester cotton buyers in the Levant. Pure cottons the English weavers were unable to make till long after. The use of cotton in manufactures extended very slowly. Between 1697 and 1749 the import of the raw material into England remained almost stationary, and there can be no doubt that about the latter date, and for some years after, the manufacture of cotton goods on the continent was greater than in England. A change in this respect was brought about by the inventions that took place in England towards the end of the eighteenth century, and revolutionised first the cotton industry, and ultimately textile industries of all kinds.

Without entering into details, it is impossible to give an idea of the nature of these inventions, but a few dates are worth noting. The most ancient method of spinning was by means of a distaff and spindle, the former an implement for holding the fibre to be spun, the latter for receiving the spun, that is, the more or less twisted fibre that forms the yarn. This arrangement was superseded by the spinning-wheel, the origin of which is uncertain. Not improbably it was used in the East long before it was known in Europe, but several forms of it appear to have been invented on the European mainland in the sixteenth century. Before the great era of inventions this machine had become common to the whole continent. The spinning jenny of Hargreaves, invented in 1764, patented in 1770, was the first machine by which more than two yarns could be spun at once. Arkwright's water-frame (so called because soon after its invention water was used as a motive power in driving it) was an improved device for the same purpose, patented in 1769. In its improved form it is known as the throstle. Crompton's mule, a sort of cross between the jenny and the throstle, constructed in 1779, was a much better contrivance than either, and is a machine still used for the spinning of weft yarns. These three machines changed in a great measure the condition of the cotton industry in Great Britain. The spinning-jenny was, indeed, an instrument that could be used in domestic spinning, and the chief

effect of its invention was that the old spinning-wheel was thrown away into lumber-rooms, and the jenny adopted in its place, with the result of greatly increasing the output of yarn in each family. Arkwright's machine, however, was one more suitable for working in large factories; and factories began to multiply when, in 1785, it was declared that Arkwright had no claim to the patents he had obtained, so that anyone might adopt the inventions patented in his name. The result was, that, whereas in the old days of the spinning-wheel the weaver might have to spend the morning going about to half a dozen cottages to obtain yarn enough to employ him for the rest of the day, now so much yarn was produced that the supply greatly exceeded the demand; the hand-loom weavers could not use it all.

The next step was the invention of the first power-loom by Mr. Cartwright, a clergyman having little knowledge of mechanics, and none of weaving. His first machine was patented in 1785, and an improved form in 1787; but even this second form had to be improved upon by further inventions before it could be made capable of weaving cloth as rapidly and cheaply as a hand-loom.

Later a new spinning-machine known as the ring-spinning-frame was invented. It was first put in operation in the United States about 1832, but not until much later was it applied with success in the United Kingdom, where, however, it rapidly grew in favour for the production of warp. In all machines improvements in detail are almost uninterrupted, and all processes conducted by machinery were greatly accelerated by the introduction of steam-power to drive the machines. This was first applied in the cotton industry at Papplewick in 1785. In the case of spinning, the result of the change since the time of the early inventions is illustrated by the following facts. When the hand-wheel was still in use it required six or eight spinners to keep a weaver employed, and the earnings of a family amounted to only a few shillings a week. Even the mule was first employed as a domestic machine, and the earnings of a family in spinning were raised in some cases to as much as £6 per week. Before the close of the eighteenth century the cost in wages of the production of a pound of yarn of medium fineness was reduced to less than a halfpenny.

All these inventions were extensively applied in England a considerable time before they were introduced on the continent of Europe. In applying them England was peculiarly favoured by its abundance of coal and iron, and its admirable situation for commerce. Moreover, the wars which raged on the continent of Europe from about the time when these inventions began to take effect down to 1815 interfered with the development of industry on the continent much more than in Great Britain. The consequence was that England became pre-eminently the seat of the cotton industry, and even in 1801 manufactured more cotton than the entire

continent of Europe. The value of cotton goods exported from Great Britain was officially estimated in 1785 at less than a million sterling; in 1815 it was estimated at upwards of twenty-two millions, and though, in accordance with what is mentioned on pp. 19-20, it must be remembered that these estimates give no satisfactory indication of growth in value, they do indicate a very remarkable growth in quantity. After that the volume of the British cotton industry, as indicated by the quantity of raw cotton entered for consumption in the United Kingdom, went on increasing with but slight fluctuations until the present century (see p. 178). In all the quinquennial periods from 1831-35 to 1906-10 there were only two in which there was a decline as compared with the previous periods, the only considerable decline being in the period of the American civil war 1861-65. On the average about four-fifths of the quantity of cotton manufactured in the United Kingdom was exported. So far as external trade is concerned, this country rapidly acquired and for long retained an unquestioned predominance in the cotton industry, in spite of the fact that we are wholly dependent on imported raw material—a predominance that was never approached in the woollen industry, even when we had almost a monopoly of one of the most prized varieties of the raw material.

The reasons for this predominance may be attributed partly to the special natural advantages which we enjoy for the industry; partly to the general causes favouring concentration of an industry developed on a very large scale; but still more perhaps to the fact that this is an industry enabling us in a peculiar degree to turn to account our great advantages for maritime trade. No class of goods has a wider market than cottons. They are consumed in all parts of the world. From any one centre of production most of the markets must be reached from the seaboard, and for such markets no country has on the whole advantages equal to our own. In turning these advantages to account in the cotton industry we were greatly assisted by our free-trade policy.

A decline set in after the First World War. In 1913, cotton piece goods exported from the United Kingdom were valued at nearly £98m.; by 1938 the figure had fallen to £32m. During the Second World War they suffered a further decline, and in 1945 the quantity exported was only 40 per cent. of the pre-war figure, though the value had fallen no more than 10 per cent. The 1951 figures afforded a more striking illustration of the change in relative values brought about by the war and its aftermath. The quantity of cotton piece goods exported was 75 per cent. of the quantity in 1938, but the value had gone up from £32m. to £132m. As showing both the magnitude and the world-wide character of the trade with individual countries, as many as fifteen countries within the Commonwealth took piece goods to the value of over £1m., ranging up to £26m., these being, in

ascending order, Sierra Leone, India, British West Indies, Anglo-Egyptian Sudan, Ceylon, Canada, British East Africa, Southern Rhodesia, Pakistan, Gold Coast, Malaya, New Zealand, Nigeria, South Africa, and Australia. Also ten foreign countries each took cotton piece goods having an export value of over £1m., ranging up to £4m.; these countries being Finland, Indonesia, Turkey, Burma, Belgian Congo, Norway, the United States, Sweden, Irish Republic, and Denmark.

In terms of distribution by continents, Africa (chiefly Commonwealth territories) provided a market for about 35 per cent. of the value of U.K. exports of cotton piece goods in 1951; Australasia, 26 per cent.; Asia, 17 per cent.; so that these three divisions of the world absorbed well over three-fourths of the whole. Europe (chiefly countries in the north and north-west) took over one-eighth, and the two Americas about one-sixteenth between them.

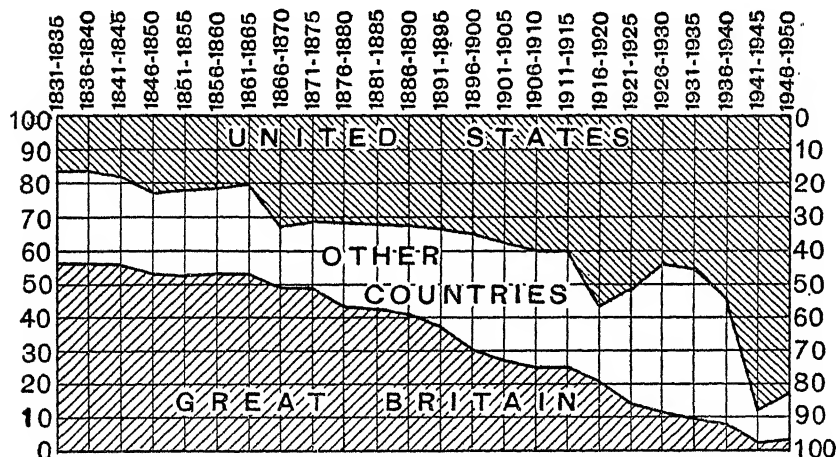


Diagram showing percentage of consumption of American cotton in Europe and the United States in quinquennial periods from 1831-35 to 1946-50. The interval between two adjacent horizontal lines represents a consumption in countries named of 10 per cent. of the total American supply.

During the long development of the British cotton industry there have been great changes in the destination of its products. In 1820 the continent of Europe received more than half the total quantity of cotton fabrics exported from Great Britain, the United States (which then had less than one-fifth of the population contained by them in 1880) received nearly one-tenth, and Eastern Asia little more than one-twentieth; in 1880 the continent of Europe received scarcely one-twelfth, the United States less than one-fiftieth, and Eastern Asia (chiefly British India) more than one-half of the whole. Of yarn Great Britain supplied large quantities to the continent of Europe; the proportion of the whole amount exported thither declined from

above 95 per cent. in 1820 to 48 per cent. in 1891, but it rose to 67 per cent. before the First World War and was about the same before the Second World War. Eastern Asia, which in 1820 received no appreciable quantity of British yarn, received in 1891 33 per cent. of the amount exported, though the proportion afterwards declined to $16\frac{1}{2}$ per cent. before the First World War and less than 1 per cent. before the Second World War, largely as a result of Japanese competition.

Such facts point to a more rapid growth of the industry in other countries, and, so far as Europe and the United States are concerned, the diagram on the preceeding page indicates very clearly that an ever-increasing proportion of America's output of raw cotton is consumed at home. The diagram shows that foreign competition is not merely a matter of recent years. Although the decline of British supremacy was hastened by the First World War, it had become inevitable. Foreign competitors were at first engaged in the easier task of conquering the home market, and only later began to compete more keenly in neutral markets. On the opposite page is a table showing the consumption of cotton in 1938-39 in all parts of the world that now work up cotton by machinery on a large scale. India, Japan, and China have all comparatively recently entered the field as competitors in the machine cotton industry. The table does not distinguish between the older and the newer seats of the cotton industry in the United States; but the growth of cotton spinning in the southern states of the Union, as well as in India and Japan, is peculiarly instructive. In the southern states the number of cotton spindles increased from 1.2m. to 4.8m. between 1887 and 1900; in India from 2.9m. to 4.9m. between 1890 and 1901; in Japan from 325,000 in 1892 to about 1m. in 1897. By 1939 there were 10.1m. in India whilst Japan's total increased from 2.4m. in 1914 to 7m. in 1930 and 11.5m. in 1939. In China the number of spindles in 1939 was estimated at 4.5m. In the case of the cotton industry of India and the United States the question of tariff hardly affects the matter. Till 1922 cotton yarns were admitted into India duty free, yet, in spite of dear coal, cotton spinning by machinery has continued to grow from its inception. The first mill was started in 1851. The geographical advantages of local supplies of raw material, abundant labour, and a local market have been decisive. Japan had a five per cent. duty on imported yarns, and has, besides the local market, the advantage of local supplies of coal to counter-balance the necessity of importing the great bulk of its raw material. In the export trade its competition was almost world-wide before the Second World War, and now already that branch of Japanese trade is showing signs of revival. In the United States the southern industry competes chiefly with that of the north, against which it enjoys no protection. Again the preponderating advantages are geographical. The growth of the

*Consumption of Cotton by World's Spindles for year ending January 31, 1939.
(From Int. Fed. of Master Cotton Spinners: Figures in thousands of bales.)*

Countries.	American.	East Indian.	Egyptian.	Sundries.	Total.
EUROPE:					
Great Britain . . .	1,080	305	294	534	2,213
Russia ¹ . . .	—	—	—	2,750	2,750
Germany ² . . .	344	148	159	724	1,375
France . . .	602	207	128	227	1,164
Italy . . .	398	64	82	111	655
Others . . .	950	240	150	761	2,101
Total, Europe . . .	3,374	964	813	5,107	10,258
ASIA:					
India . . .	96	3,056	59	364	3,575
Japan . . .	961	1,157	83	704	2,905
China ¹ . . .	38	80	12	1,320	1,450
Total, Asia . . .	1,095	4,293	154	2,388	7,930
AMERICA:					
U.S.A. . .	5,942	49	38	28	6,057
Canada . . .	240	2	5	1	248
Mexico . . .	—	—	1	180	181
Brazil . . .	—	—	—	672	672
Total, America . . .	6,182	51	44	881	7,158
OTHERS . . .	129	44	127	727	1,027
Grand Total . . .	10,780	5,352	1,138	9,103	26,373

¹ Estimated.

² Including Austria.

industry, particularly in India and Japan, greatly affected the industry of Lancashire, which was compelled to turn its attention more and more exclusively to the higher (finer) counts of yarn, and the production of a greater proportion of woven goods for the Eastern markets—that is, goods in which the advantages of a more highly organised industry producing for a wider market can still tell. It was the increased production of finer yarns in the United Kingdom and the diminished production of the coarser yarns that accounted for the increase noted on p. 184 in the proportion of British yarns sent to the mainland of Europe, and for the fact that the number of cotton-spinning spindles in Great Britain remained so long much greater than in all the other countries of Europe put together. In March 1914 the United Kingdom had 56m. (January 1939, 36m.); on the mainland of Europe there were 44m. (January 1939, 50m.). A similar change has been brought about in the northern seats of the American industry by the development of the southern. But in neither case did the change stop there. Both India and the southern states of the Union began to manufacture the finer yarns in greater and greater quantity. In 1900–01 more than 20 per cent. of the weight

of yarns produced in India was of counts above 20s. By 1918-19 under the stimulus of the scarcity of supplies from Lancashire during the First World War this had risen to 35 per cent. A steadily increasing quantity of woven goods has also been produced by mills in India. Likewise in the south-east of the United States and in Japan, a steadily increasing proportion of spindles has been devoted to the higher counts. Notwithstanding all the changes, in 1951 Britain still had over a fifth of the world's spindleage (28m. out of 126m.) and nearly four-fifths of the 'mule spindles' (world total 23m.) necessary for the finer qualities.

In the spinning of raw cotton into yarn by the ordinary processes there is about one pound lost as waste in every six pounds of raw cotton, and there is further loss in the manufacture of cotton cloth. For some time this waste has been treated in large quantities on the continent of Europe in such a manner as to make it available for the spinning of either pure or mixed yarns, and this industry has also been introduced into the United Kingdom. Cotton waste is also largely exported for wiping and polishing.

TOBACCO. The tobacco of commerce consists of or is obtained from the dried and otherwise prepared or 'cured' leaves of several species of a genus of plants known to botanists as *Nicotiana*, and now cultivated more or less in almost all parts of the world that have a warm enough summer. The use of tobacco in smoking and other ways is due to the presence in the leaf of a principle known as nicotine, which enables it to act as a stimulant and narcotic, but which, being an active poison, is capable of exercising most injurious effects if swallowed. Besides being used as a luxury, tobacco is used to a small extent in medicine, and more largely as a **sheep-wash** for the destruction of insects which infect the fleece. The species of tobacco most usually cultivated is the *N. tabacum*, Linn., which grows to the height of from four to six feet, and produces several clusters of white or beautiful pink flowers.

The tobacco plants are all natives of America, and the use of the leaf in smoking was widespread in that continent at the time of its discovery, in 1492. The practice was quickly adopted by the European discoverers, and by them was introduced into Europe, where, notwithstanding the prohibitions and denunciations of popes and crowned heads, it spread, at first slowly, afterwards more rapidly. In Europe the plant is said to have been first cultivated for its ordinary uses in Holland in 1615, but it soon extended to other countries. The increasing fondness of the people for the enjoyment of this luxury induced governments to encourage the cultivation for the sake of raising a revenue out of it. In Great Britain the cultivation of tobacco was forbidden at an early date for the sake of encouraging it in Virginia, where it became an important object of agriculture and article of commerce almost

immediately after the foundation of the colony. In Ireland, the cultivation of the plant was allowed till the reign of William IV, when an Act was passed prohibiting it there also, for the sake of the convenience of raising the revenue; and both in England and Ireland the prohibition was continued till 1886, when the cultivation of the plant was again allowed under certain conditions which were further relaxed in 1910.

Like maize, barley, and potatoes, tobacco is adapted to very diverse conditions. It can be grown anywhere in the tropics, and has been cultivated with success even in some of the counties of Scotland. The period within which it comes to maturity varies according to circumstances, and the limitation of its range arises principally from the necessity of protecting it during growth against frost. This is particularly necessary in the early stages, when a single white frost is enough to spoil the whole crop; and this is one reason that recommends the usual practice of sowing the seed in small beds, from which the tobacco is afterwards planted out in the fields, for in these seed-beds the seedlings can be sheltered from frost by being covered with dried leaves or some other light material. Stagnant water about the roots is also quickly destructive to the plants.

Tobacco: Production and Exports in million lb.

Country.	Average, 1934-38.		1951.		Country.	Average, 1934-38.		1951.	
	Yield.	Export.	Yield.	Export		Yield.	Export.	Yield.	Export.
U.S.A.	1,301	437	2,329	522	Japan	141	8	211	—
China	1,382	34	1,593 ¹	1 ¹	Greece	126	97	137	69
India	1,102	47	562	109	Turkey	122	64	181	127
Pakistan		—	161	—	Burma	100	4	111	—
U.S.S.R.	494	8	—	—	Italy	96	12	179	17
Bulgaria	288	53	150 ¹	72 ²	Canada	63	11	154	29
Indonesia	229	106	—	27	Cuba	48	27	77	38
Brazil	204	69	257	81 ²	S. Rhodesia	23	20	92	67

¹ 1948.

² 1947.

³ 1950.

Adaptable as tobacco is to a great variety of conditions, it exhibits in a peculiar degree the effect of this diversity in the differences of the characteristic qualities of the product. The tobacco obtained from a variety of the plant adapted to one soil and climate is widely different from that which is obtained from a variety adapted to a different soil and climate. These diversities are well illustrated within the wide area of the United States, in which Wyoming was the only region without tobacco cultivation down to 1880. The chief tobacco states of the Union are North Carolina, Kentucky, Virginia, Tennessee, South Carolina, and Georgia, especially between about 36° and 38° N.

The total area under tobacco in the world is estimated at about 8m. acres, producing over 7,000m. lb., compared with 6,500m. lb. before the Second World War. The greater part of this production is

consumed locally; only about one-fifth of it enters into world trade. The following table shows the production and export of the chief tobacco-growing countries in 1951, compared with the pre-war (1934-38) annual average. While up-to-date figures are lacking for some countries and there is evidence of decline in disturbed areas, there is also evidence of notable development among some of the smaller producing countries.

It will be seen that some of the chief producing countries play only a minor part in the tobacco trade of the world. The United States leads in respect of both production and exports; it not only vies with China and India as one of the three great sources of world production, but it supplies from a half to a third of the tobacco entering into international trade. On the other hand, China and India export comparatively little, whereas some of the minor producing countries are world famous for their products. Cuba is especially noted for the quality of its cigars, which take the name of Havanas from the place of export. The genuine article carries a government guarantee; spurious 'Havanas' are made in several countries. Jamaica too has gained a reputation for its cigars, and since the outbreak of the Second World War has displaced Cuba as the main source from which the United Kingdom imports cigars. Sumatra and British North Borneo vie with one another in producing the best cigar wrappers, a fact due partly to soil and climate, partly to care in treatment. Hungary enjoys the reputation of producing the best European-grown tobacco.

In recent years Africa has come to the fore as a minor but increasing source of supply, the chief producing countries being South and South Central Africa and Algeria; in Southern Rhodesia and Nyasaland tobacco is the main agricultural product for export. Egypt manufactures a particular kind of cigarettes which are known by its name on the world's markets, but it imports practically all its tobacco.

Under the regulations permitting the cultivation of tobacco in Britain, crops have been grown from time to time with some success, but commercially they are negligible. The United Kingdom imports more tobacco than any other country, mostly for home consumption. All but a minute percentage is unmanufactured, much higher duty being charged on manufactured tobacco (largely cigars and snuff). Before the Second World War the imports of unmanufactured tobacco amounted (1938) to 345m. lb., of which 75 per cent. came from U.S.A. In 1946 the quantity was up to 433m. lb., with the United States supplying 85 per cent. Currency restrictions, especially in connection with dollar imports, reduced the total in 1948 to 281m. lb., and only 60 per cent. came from the United States; but in 1951 the imports—355m. lb.—were back to pre-war level, though the United States' percentage was still down to 60.

Before the Second World War, Germany was the second biggest importer of unmanufactured tobacco, and Holland third, the Dutch imports being largely for manufacture into cigars for export (over 20m. cigars were exported in each of the years 1938 and 1939). After the war, German imports ceased for a time and Dutch imports were very greatly reduced (partly because of the troubled conditions in the Netherlands East Indies, which had been a chief source of supply) ; with the remarkable result that the United States, the world's largest producer and exporter of tobacco, became in 1945 and 1946 the biggest importer after the United Kingdom, though very far behind (annual imports about 80m. lb.—chiefly Oriental leaf from Turkey and Greece for blending, and cigar leaf from Cuba and Puerto Rico). By 1951 the United States, Holland and Western Germany were each importing rather more than 100m. lb., and France 70m. lb.

It is noteworthy that in the British Commonwealth the largest producer after India, though far behind, is Canada. Supplies are grown in Southern Ontario and Quebec, mostly for home consumption, which has much increased in Canada as in the United Kingdom and the United States. Exports of unmanufactured tobacco are less than those of Southern Rhodesia, but the tobacco manufacturing industry has developed; exports of cigarettes increased from under half a million in 1939 to 514m. in 1945.

OPIUM. Opium is the hardened juice of a cultivated species of poppy called *Papaver somniferum*, Linn., which is believed by some to be only a variety of the wild species *P. setigerum*, DC., a native of the shores of the Mediterranean. There is reason to believe that the cultivated form has existed in India for a period not far short of three thousand years. The juice is contained in the seed-vessel, the wall of which is scratched so as to allow it to exude. It then hardens, and is picked off. Opium is chiefly used as a stimulant or narcotic, and is either swallowed in small quantities or smoked (by itself or in prepared mixtures), or taken in the form of certain preparations made from it. Of these the most important are laudanum, which is made by soaking opium in spirits of wine, and solutions of morphia, which is the narcotic principle of opium.

Formerly, India was the country in which opium was chiefly grown as an article of foreign commerce, and its cultivation in British India was made a monopoly of the government, which once derived from it an annual revenue of about ten millions sterling. It was grown in the Ganges valley, round Patna and Benares, and on a fertile table-land further west, corresponding to the old kingdom of Malwa. Towards the end of 1906 edicts were issued by the Government of China having for their object the suppression of the use and cultivation of opium in that country within ten years, and in 1911 the Government of India agreed to bring the export entirely to

an end in 1917 or earlier, if proof was given of the absence of native-grown opium in China. There is now no ordinary trade in opium between India and China. In 1923 the Government of India adopted the certificate system recommended by the League of Nations, whereby any export of opium must be covered by a certificate from the Government of the importing country, approving the consignment as being needed for legitimate purposes. Also, in 1926, the Government of India undertook to reduce the export of opium to Far Eastern countries by 10 per cent. per annum until it was extinguished.

As a result of these various measures, the area under cultivation for opium in India dropped from 615,000 acres in 1906-07 to 43,000 acres in 1930-31 and 4,812 acres in 1938-39. During the Second World War, official demands for opium for medical and scientific purposes sent the acreage up again, and in 1943-44 it was returned as 36,415 acres. Cultivation is virtually restricted to a tract in the former United Provinces (now Uttar Pradesh) near Ghazipur, where the Government maintains an opium factory.

Outside of China and India, opium is chiefly consumed in Mohammedan countries, where it has a fairly general use as a substitute for wine and spirituous liquors. Iran (Persia) and Asia Minor are the principal countries of western Asia in which this drug is cultivated, and in both it forms an article of export. In quality the product of Asia Minor surpasses that of any other part of the world. In the countries of western Europe opium is chiefly used in medicine, and the English supply is mainly derived from Asia Minor (Smyrna).

According to a report issued in 1948 by the Permanent Central Opium Board, which functions under the United Nations, world production of raw opium in 1936—the latest year to which a world total was assigned—was 3,761 metric tons. Of this, all but 10 per cent. was accounted for by China (1,612 tons), Iran (1,347 tons), and Turkey (426 tons). Production was mainly for home consumption; world exports were returned as only 400 tons. India's export was only 11½ cwt., and British India's production only 169 tons; but the inclusion of the Indian States would add another 200 or 300 tons to the totals for both local and world production.

TEA is the name given to the dried leaves of one or more shrubs or trees allied to the camellia. The agreeable stimulant to which tea owes its value in commerce is, chemically, almost identical with that found in the two commodities next considered, coffee and cocoa. These three commodities likewise agree in requiring for their cultivation at least warm summers with frequent rains, although they differ greatly in the degree of cold they will stand. They also agree in requiring more or less cheap labour to prepare them for the market, and this necessity in many cases excludes them from regions

where the climate is quite suitable. Lastly, they agree in being derived from trees which take a certain number of years to come into profitable bearing, and this circumstance would appear to have some effect on the fluctuations of prices of these commodities, and hence indirectly on their geographical distribution. The fluctuations in price are very striking in the case of coffee. No doubt several causes have contributed to these fluctuations, but it may be suspected that one cause is to be found in the long period of waiting for returns. High prices are likely to stimulate the laying out of coffee plantations in all parts of the world that meet the requirements of climate and labour. When these plantations come into bearing there is likely to be an over-supply, leading to a fall of prices that tends to throw out of cultivation the plantations in those parts of the world that are least favourably situated. Somewhat similar fluctuations are observable in the case of cacao (cocoa) prices, but not in the case of tea, the price of which fell almost uninterruptedly from 1865 to 1904. Here we have to note another geographical effect. During the period of falling prices the area under tea steadily expanded in India, and latterly also in Ceylon, but the increasing production of these two parts of the world told severely on China, which lacked modern methods of transport, and only by slow degrees and to a very limited extent introduced modern machinery for preparing the leaf. In 1881 China's exports of tea were about 300m. lb. a year; before the end of the century they had dropped by nearly a third. The decline continued into the present century, accelerated by the disturbed conditions in China, and in the quinquennium before the Second World War the exports by sea—by far the greater part of the exports—averaged only 90m. lb. During the war they dropped still lower. It is thought that even now China may be producing more tea than any other country, but there are no data for a worthwhile estimate.

Considering the extensive consumption of tea, coffee and cocoa one may well be struck by the comparatively small areas required for their production. J. C. Willis in his *Agriculture in the Tropics*, published in 1914, when coffee-growing was nearing its zenith, estimated the crop area at about 5m. acres, or 7,800 square miles—little more than the area of Wales. In the five pre-war years, 1934–38, the annual production averaged about 2·2m. tons, which also seems comparatively small for the world supply, in view of the fact that it was less than half the weight of wheat and flour which the United Kingdom alone imported annually. Willis's estimate for cacao was 240,000 tons (in 1911) from 1·8m. acres or 2,800 square miles—the area of the West Riding of Yorkshire. Since then the production of cacao has trebled. Tea is the smallest crop and covers the smallest area of the three products. In the absence of official estimates for China, total figures must be partly guesswork, but

the area under tea in 1934-38 may be put at 4,000 to 5,000 square miles and production at over 500,000 tons—say 1,250m. lb.

The tea-plant comes into full bearing in the fifth year. It generally grows to the height of from three to eight feet, but sometimes much higher. One variety, which grows wild in Assam, and is by some regarded as the stock from which all other tea-plants are derived, attains the dimensions of a tree. The name of the plant and its product is Chinese, which is due to the fact that it was in China that the plant was first cultivated, and that Europeans first became acquainted with it. Even in China the plant is said to have been unknown till the middle of the fourth century of the Christian era, and it did not come into general use in that country till four or five centuries later. The first European who is known to have mentioned it is the traveller Pinto, who visited Canton in 1544. As late as 1664, the English East India Company, when it wished to make a present of some tea to the King of England, had to buy a small quantity from the Dutch, and when it was first imported into England, in 1665, it was sold at the rate of £3 per lb.

Tea is one of the hardiest of all sub-tropical plants. Severe frosts, such as it is exposed to in northern China, check its growth and diminish its yield, but do not kill it. The plant is hence suited for a wide range of climate, but the climate best adapted for it is that which is warm, moist, and equable throughout the year. Like the cotton-plant the tea-shrub requires regular supplies of moisture during the summer months, but is easily injured by an excess of moisture settling about its roots; so that the ground on which it is grown ought to have good drainage. All these conditions are best obtained on the slopes of mountains within the tropics or in sub-tropical regions, and it is in such situations that tea is chiefly grown up to an elevation which varies with the latitude.

The soil best suited to the tea-plant is virgin forest soil, a light, rich, friable loam containing a good supply of vegetable mould or humus, or of organic matter in some other form; and such soils are also most readily obtained in the situation just described. The presence of iron either in the soil or subsoil is desirable, and hence reddish soils are preferred to others equally suitable in other respects. It is noteworthy that, unlike cotton, tea is chiefly grown, in the principal producing countries, on soils remarkably poor in lime.

But the successful cultivation of the tea-plant depends not merely upon soil and climate. In its preparation for the market, tea demands much hand-treatment, so that it can be profitably grown as a marketable commodity only in those parts of the world which, besides having the other conditions suitable, have plenty of cheap labour. It is for this reason that China, India, Ceylon, Indonesia, and Japan are the principal countries of its production.

In China the first crop of leaves is gathered at the end of the

third year, but care has to be taken not to exhaust the plant by stripping it too closely. Thrice in the year the leaves are picked—in the third, fifth, and eighth month. The best leaves are the young ones, and as the youngest are first picked, the earliest gathering is the best. Women and children are mainly employed in this work. Having been first dried in the sun, the leaves are then trodden out by naked-footed labourers, in order to break the fibres and extract the moisture. This done, they are heaped up and allowed to heat for some hours, until they have become a reddish-brown colour. They are next rolled up by hand, and are afterwards again exposed to the sun should the weather be propitious; but if not, they are slowly baked over charcoal fires. The object of the rolling is to mass the leaf in a state conducive to rapid fermentation, which is brought about by exposure of the leaf to a temperature of 104° F. for about an hour, and has the effect of reducing the proportion of tannin in the leaf from ten or twelve to about five per cent. The fermentation is finally stopped by drying in the sun or by baking over charcoal fires. With this process the preparation of the leaves in the form in which 'black tea' is mostly sent to the market is complete, and they pass from the hands of the growers to those of the native merchants. By these purchasers they are carefully sifted, the leaves of different sizes and ages are separated, and the stems and damaged leaves are removed. In the preparation of 'green tea' there is no fermenting process, but the leaves are merely roasted in an iron pan while being stirred with a stick, and then rolled a little, these operations being repeated several times in succession and the tea finally dried off. Rolling machinery is very little used in China, but the severe competition brought about by the development of tea cultivation in India and Ceylon has, since about 1898, led to its introduction.

Tea is also prepared in China in the form of bricks and tablets for convenience of land transport by porters or pack-animals. The ordinary brick-tea is made only of the refuse of the tea prepared by ordinary methods—inferior tea-leaves, stalks, and tea-dust. But of late years the finest tea-dust has been compressed by steam machinery into tablets of tea of excellent quality, which are exported to Russia. A kind of tea known as 'flat tea' is prepared in Japan from unrolled leaves picked from bushes that have been partly blanched by being grown in the dark for two or three weeks before picking.

The introduction of tea-cultivation into India was due to government incentive. Experimental plantations were started by the Indian government on the hills of Assam, and at different points on the southern slopes of the Himalayas, between 1834 and 1849, and a grant of land was made by the government to the first private tea company formed in India, in 1839. It is only since 1851, however, that tea-planting in India has been a marked success. During the

intervening century the area under cultivation has increased to about 840,000 acres.

Assam alone contains 440,000 acres—more than half the total area of Indian tea-plantations; but tea is also extensively grown at various points on the Himalayan slopes, in Bengal, in Uttar Pradesh, and even in the Punjab; also on the Nilgiri Hills in southern India, and to a very small extent in Lower Burma. In northern India the limit in height of profitable cultivation is mostly about 3,500 feet above sea-level, but on the Nilgiris the best elevation is from 4,800 to about 5,600 feet.

There are three main varieties cultivated in India—the Chinese plant, which yields a comparatively weak tea, and furnishes a small yield; the native tea of Assam; and a cross between the two, which last is most in demand among the planters. The method of cultivating and preparing tea in India is much the same as in China, except that the bushes while bearing (that is, during the southern monsoon, March to November) are picked about once every ten days, and that the rolling is performed by machinery. The average yield of an acre under tea in India varies greatly in different localities, but improved methods of cultivation have brought about a long-continued and marked general increase. In 1882 the average for the whole of India was under 300 lb. per acre; in 1910 it was above 450 lb. In the pre-war quinquennium 1934–38, when the average annual production was 414m. lb., the yield per acre averaged close on 500 lb., and by the end of the half century both production and yield were about half as large again. Even before the war, world production was so high that a number of countries, including India, Ceylon, and the Netherlands East Indies, entered into an International Tea Agreement to regulate exports. Government bulk purchases and rationing regulated supplies in the United Kingdom during the war and early post-war years, but when controls were removed in 1952 it was found that supplies had again overtaken demand. The United Kingdom has always taken the great bulk of India's exports of tea, which before the war amounted to about 350m. lb. and increased to 445m. lb. in 1951.

About 1880 the cultivation of tea in Ceylon began to extend with extraordinary rapidity in consequence of the failure of the coffee-plantations. The soil and climate have been found to be admirably suited to the shrub, which has yielded in some localities as much as 1,000 lb. an acre, though the average is about 500 lb. Cheap coolie labour, no longer required on the abandoned coffee-plantations, has afforded the means of preparing the product for the market at the smallest possible cost. Leaf-rolling machinery is in general use, and all the operations up to the export stage are performed on the estates. In 1883, for the first time, Ceylon's exports of tea exceeded 1m. lb., and so rapid was the growth of the plantation industry that

by the end of the century they had risen to nearly 150m. lb. During the present century, production—nearly all for export—has risen to 326m. lb. (1951). A third or more of the tea exported is shipped to the United Kingdom.

The production of tea in Indonesia has made great strides since the first plantation was made in Java in 1827. Before the Second World War the output was about three-fourths of that of Ceylon. Over 80 per cent. of the total was grown on plantations managed by Europeans or Chinese, the remainder being grown by the native population on small holdings. The most important area is between 1,000 ft. and 4,500 ft. above sea-level in western Java, and the output both there and in Sumatra was increasing until first the Japanese occupation, and then the destruction following on revolutionary disturbances, caused a serious setback to the industry and for the time being practically put a stop to commercial dealings. 1951 saw a considerable revival of production, but the amount was still less than two-thirds of the pre-war total.

The cultivation of the tea-plant is said to have been introduced into Japan and Korea early in the ninth century A.D., and before the Second World War Japan had a tea-export trade surpassed only by India and Ceylon, Java and China. But here too the war led to a great falling off both in production and in exports. A steady recovery increased production to two-thirds of the pre-war level by 1951. Japan tea is mostly prepared as green leaf (the leaf being simply steamed, rolled and fire-dried). Almost the whole of the export is taken by the United States.

The cultivation of tea has likewise been developed with more or less success in Indo-China, Formosa, Malaya, the U.S.S.R. (Trans-Caucasia), Brazil, Natal, parts of East Africa, and Mauritius. The high price of labour in the United States generally makes tea unfit for cultivation as a marketable commodity, though it has been grown for home use on a small scale on many of the farms in the southern states, and in California. Tea of excellent quality has been grown among the German colonies of southern Brazil. Of recent years Nyasaland and Kenya have developed useful though comparatively small supplies.

Before the Second World War the exports of tea from the chief exporting countries totalled over 900m. lb. During the war they dropped by about one-third. The United Kingdom, which has long imported more than all the other tea-importing countries put together, continued to hold this lead throughout the war, though individuals were rationed and purchase by merchants in open market gave place to bulk purchase by Government. Indeed the war increased rather than diminished the popularity of tea as a beverage in the United Kingdom. The estimated consumption per head of the population dropped of necessity from 9.3 lb. in 1938 to 7.0 lb. in

1943, but rose again to 8·8 lb. in 1946 (8 lb. in 1951, before de-rationing in 1952), demonstrating that the British people are the biggest tea-drinkers in the world. Eire and Australia come next, with between 7 lb. and 8 lb. per head, then New Zealand with a post-war figure of 6·5 lb., and Canada with 3 lb. Curiously enough, French Morocco is next in the list with 2·8 lb. The only other countries with a post-war annual consumption of over 1 lb. per head are Ceylon, Egypt, and Holland; even the United States, which imports more tea than any other country outside the United Kingdom, averages only from 10 to 12 oz. per head.

COMMODITIES (continued)

I.—C. Tropical Products

COFFEE. The coffee of commerce consists of the seeds (the so-called 'beans') of several species of trees or shrubs, chiefly of one species known to botanists as *Coffea arabica*, Linn., which if left to itself grows to the height of twenty-five or thirty feet, but in cultivation is frequently kept down to the height of from three to eight feet in order to facilitate the gathering of the fruit. The seeds are enclosed in dark cherry-red pulpy berries, each of which usually contains two. The tree comes into full bearing in six years, and remains profitable for from thirty to forty years, after which the soil is worn out. The best soil for the coffee-tree, as in the case of tea, is said to be virgin forest land rich in vegetable remains, the accumulations of past ages. A warm and moist climate is required for it, but the heat must not be excessive. An almost ideal climate for coffee is found in Yemen, the home of the original Mocha coffee. Here, winter and summer alike, a thick mist ascends every morning from the low grounds on the coast to the slopes on which the coffee is grown. About midday the plantations themselves become enveloped in mist, which lasts till after the time at which the greatest heat of the day is usually experienced elsewhere, and then disappears. So regular is this occurrence that in certain places there are scarcely twenty days in the year on which the mist fails to rise. By night, on the other hand, the air ascending from the hot plains helps to prevent an excessive lowering of the temperature, so that we have, as it were, a hothouse culture with natural self-regulating arrangements.

For the most part, coffee-trees, at least when young, must be cultivated either under cover or under the shelter of trees better fitted to stand extreme heat. Bananas and erythrinæ are frequently grown for this purpose, and in Brazil a tall, coarse pea, which enriches the ground with valuable manure when it dies down, is often planted with the same view. On the other hand, the coffee-tree cannot stand continued frost; and though it has to endure occasional frost in Paraguay, in most coffee-growing countries the mean temperature of the coldest month is above 52° F., and the mean minimum temperature about 42½°. On this account, its range in

latitude is more contracted than that of tea. Coffee, indeed, is not grown to any great extent outside of the tropics, although the most important place of production, the coffee region of Brazil, lies just beside the southern limit of the tropical zone.

Even within the tropics, the cultivation of coffee is generally restricted to comparatively limited areas; the reason of which is that coffee is a product grown almost solely as a mercantile commodity, that is, for consumption outside of the regions in which it is produced, and, at the same time, is one that demands a large amount of labour in preparing it for the market.

The preparation which the coffee-beans have to undergo before they are ready for the market consists in their separation from their coverings and the processes of drying and 'curing.' In making the finest kinds of coffee the berries are, first of all, **pulped**, or stripped of the outer pulpy covering, in a machine specially devised for the purpose. The **curing** process which then follows consists in exposing the beans to the sun for six or eight days; and as the beans after being pulped are extremely sensitive to injury from rain or dew, great care must be taken during this stage to protect them from these influences. When cured the beans are, in most coffee districts, sent to coffee-works erected in the larger towns or the sea-ports to be **hulled** or **peeled**—that is, divested of two coats in which each of the beans after pulping is still wrapped. Before being put into bags for shipment the beans are winnowed, graded, and sorted, the sorting being not only according to quality but also according to size, since beans of the same size can be more equally roasted before being ground.

The use of coffee as a beverage appears to have been very limited till within the last two or three hundred years. The oldest work known to have collected traditions regarding the origin of the practice is an Arabic manuscript belonging to the year 1587; and from this it would appear that the original home of the coffee-tree is to be found in the southern parts of the highlands of Abyssinia, where it is undoubtedly a native. Thence it was introduced into south-western Arabia, and through the Arabs it became known to Europeans. It is to this fact that the tree owes its specific name of *arabica*, while the generic name, and the ordinary name of the plant and its product, is derived from that which was given to it by the Arabs, and this again is possibly derived from Kaffa, the name of one of the highland districts of Abyssinia whence the tree was originally brought. The introduction of coffee into Arabia must have taken place at least as early as the eleventh century, but even in the middle of the sixteenth century the beverage was still unknown at Constantinople. About a century later still (in 1652) the first coffee-houses were started in London, and these soon became favourite resorts of the wits and men of letters of the time; but in

England the drinking of coffee was gradually given up to a large extent in favour of tea, which was introduced even more recently. On the mainland of Europe, on the other hand, coffee has come more and more into favour; and it is also largely consumed among the people of the United States. The order of leading countries as coffee-drinkers was modified by the Second World War. While consumption per head of the population increased in many cases, in others the impact of the war, either in Europe or in the colonies, led to a big decline. Below is given the consumption in lb. per head in a dozen countries in 1938 and 1946:

	1938	1946		1938	1946		1938	1946
U.S.A.	15.2	19.4	Denmark	16.8	8.6	Holland	9.8	1.5
Sweden	18.5	16.3	Germany	5.0	—	U.K.	0.7	1.4
Brazil ¹	14.3	15.7	Canada	3.7	4.9 ²	Australia	0.6	1.2
Belgium	12.9	15.0	France	9.8	3.5	Italy	1.9	0.8

¹ Estimates for 1940 and 1942. Estimates for earlier and later years not available.

² Estimate for 1945.

The United States, which heads the post-war list, stands in much the same commercial relation to coffee as the United Kingdom does to tea. Not only have its people become the biggest coffee-drinkers, but it imports more coffee than all the other coffee-importing countries put together. This latter statement was true before the Second World War; during the war the proportion taken by the United States went up to 75 per cent. and more. It is interesting to note that in 1946 the United States consumption of coffee was 19.4 lb. per head against the United Kingdom consumption of 8.8 lb. of tea per head; this corresponds roughly with the comparative amounts of coffee and tea that are needed in preparing equal quantities of the two beverages.

The coffee-growing countries of the world fall into three main groups—South and Central America, the dominant factor in world supply; India and Indonesia, more important in the past than in the present; East and West Africa, young and growing sources of supply in the colonial territories of Britain and France, Portugal and Belgium. In all, the area under coffee before the Second World War was estimated at over 12m. acres and production at about 44m. cwt. Exports in the pre-war quinquennium averaged about 33m. cwt., of which Latin America provided over 80 per cent., and Brazil alone over 50 per cent. Acreage, production and exports all declined during the war, especially in Brazil and Venezuela. In other countries the position kept fairly stable, and in Brazil production has been creeping up again, though still short of pre-war output; while exports have regained their pre-war level in nearly all countries, and in some have gone far beyond it.

Brazil has occupied an outstanding position in respect of coffee production and export for a century past, generally averaging two-

thirds of world production and from a half to two-thirds of world exports. The coffee-tree was introduced into northern Brazil early in the eighteenth century, but not till about 50 years later into the region where it has since flourished so well. The coffee-producing region in Brazil lies between about 21° and 24° S., and is divided into two zones, one of which is traversed by a system of railways connected with Rio de Janeiro, and the other by a system connected more directly with the more southerly seaport of Santos. The coffee-growing area is, in general, the plateau with rich volcanic soils sheltered behind the coast range at a height of 600 to 2,500 feet above sea level. In 1906-7, a year of very high production, Brazil furnished 80 per cent. of the world's total. In 1917 the area under coffee in Brazil had grown to $4\frac{1}{2}$ m. acres, and in later years it nearly doubled that acreage. The result was over-production, and in 1931 the Brazilian Government placed the sale of coffee under federal control. To bring supplies down to demand, large quantities of coffee were destroyed—78m. bags over a period of 14 years.¹

Brazil's restrictive practices, while helping to maintain prices, encouraged other countries to increase their output, and in 1937 Brazil reversed her policy; but the Second World War brought wider control through an Inter-American Coffee Convention, to which the United States was a signatory. The area under coffee in Brazil dropped from over $8\frac{1}{2}$ m. acres before the war to about $5\frac{1}{2}$ m. acres, and production from 28m. cwt. to under 10m. cwt. The decline was not due wholly to the war; planters were relying less on coffee, and, moreover, yields suffered from a succession of bad seasons, with drought and frost. In 1951 production was up to 22.8m. cwt.

In general, the war benefited the coffee-planting industry. Adverse weather conditions were not confined to Brazil, and with smaller crops and increased consumption in the United States, the pre-war surplus stocks were gradually reduced. At the end of the war, a Pan-American Coffee Conference recommended the removal of all restrictions and controls.

No other country comes anywhere near Brazil as a producer of coffee, but the other countries of Latin America together provide most of the balance of the world's supply. Colombia is easily second, with exports of 5m. cwt. in 1938 and nearly 6m. cwt. in 1951, as compared with Brazil's 20m. and 19m. respectively. El Salvador, Guatemala and Mexico each export about 1m. cwt. In point of quality, no coffee surpasses that of the district of Alta Vera Paz, in northern Guatemala, where the cultivation is carried on with peculiar care. The Blue Mountain coffee of Jamaica is also famous.

Before the war, the Dutch East Indies ranked next to Colombia,

¹ The Brazilian bag of coffee weighs 60 kilos (132 lb.), or about 17 bags to the ton; so that the quantity of coffee destroyed was over $4\frac{1}{2}$ m. tons.

with annual exports of between 1m. and 2m. cwt. The Japanese occupation of the islands during the war and the post-war revolution almost killed the trade for the time being, but there was a recovery in 1951 to $\frac{1}{2}$ m. cwt. The introduction of the coffee-tree into Java dates from 1650, when it was carried by the Dutch from Arabia. Plantations are generally at a height of from 2,000 to 4,000 ft. above sea-level. Formerly about two-thirds of the coffee grown in Java was grown on government plantations, but later the production of private plantations greatly increased. Coffee in Java suffered from disease, as did coffee in Ceylon, but the replacement of *Coffea arabica* by the disease-resisting Liberian coffee (*C. liberica* or *C. robusta*) enabled the industry to recover in Java. In Ceylon, as previously noted (page 194), the industry practically died out and was replaced by tea planting.

The cultivation of coffee in India is said to have been introduced about two centuries ago by a native Mohammedan on his return from a pilgrimage to Mecca; but it was only after 1840 that it spread with any great rapidity. The coffee plantations are mainly in Mysore and Madras on the eastern, and therefore more sheltered, slopes of the Western Ghats, to the south of about 15° N. The most desirable elevation on these mountains is from 2,500 to 3,500 ft. above sea-level. The tree is also cultivated on much lower ground farther east, but it is nowhere grown with success in northern India. At no time has production or export been more than a very small percentage of world supply, and in the early decades of the present century the proportion declined to less than one per cent. In the quinquennium before the Second World War, the area under coffee averaged 185,000 acres and the production 325,000 cwt. Both acreage and production were well maintained during the war, and in 1945-46 the yield was over $\frac{1}{2}$ m. cwt. but that figure was not maintained, and in 1951 the yield was only 369,000 cwt. Exports, which had averaged 180,000 cwt. before the war, dropped to 24,000 cwt. in 1945 and were only 75,000 cwt. in 1950, while in 1951 they were as low as 20,000 cwt.

In Africa, coffee-growing made considerable strides both before and during the Second World War. Kenya coffee (*arabica*) early gained a high reputation on the London market, and in 1938 Kenya, Uganda, and Tanganyika together exported, in roughly equal quantities, nearly 0·9m. cwt. During the war, more pressing needs, combined with a series of dry seasons, led to a drop of 50 per cent. in Kenya's exports, but Tanganyika's exports were well maintained, and those from Uganda increased; with the result that in 1951 the combined exports of coffee from these three territories totalled 1·4m. cwt. Uganda contributed 0·9m. cwt. to this total, and is now the biggest coffee-grower and exporter in the Commonwealth. Still more marked was the development in Madagascar and French West

Africa, in Portuguese West Africa, and in the Belgian Congo. The combined export of these four territories increased from 1·9m. cwt. in 1938 to 2·6m. cwt. in 1946, and 3·8m. cwt. in 1951. It will be seen that altogether the seven territories named exported 5·2m. cwt. in 1951. Africa's total exports were about 5·7m. cwt., or 15·5 per cent. of the world total.

CACAO. Cacao, or cocoa, as it is more frequently but rather unfortunately called, is the product of an American tree *Theobroma cacao*, L., not to be confounded with the coconut-palm or the coca shrub. The tree comes into full bearing in twelve years (in favoured regions earlier) and continues to yield good returns for about thirty years, after which the yield begins to decline. The form in which it enters into commerce is that of cacao-beans, which are the seeds contained, to the number of fifty to one hundred and fifty, in a red or green fleshy fruit from six to ten inches in length. These beans or seeds, which form an important article of diet among the natives of tropical America, are composed to the amount of half their weight of a fat known as cacao-butter, which has the valuable property of never becoming rancid, however long it is kept. The extraction of this fat has become a considerable industry. Being rather difficult of digestion, however, this fat is generally removed, as far as possible, in preparing cocoa for drinking or chocolate. Among the constituents that remain are flesh-forming compounds, on account of which cacao is highly esteemed for its nutritiousness.

Before entering into commerce the cacao-beans have, like those of coffee, to undergo a preliminary treatment, and the quality of the article depends greatly on the care bestowed on the necessary processes, the price of well-prepared beans being often more than double that of beans prepared in a more slovenly fashion. The first process is one for setting up fermentation, which removes a disagreeable bitter flavour, destroys the power of germination in the seeds, and prevents mustiness. The best cacao-beans are fermented for a period of five or seven days, by placing them in a heap along with plaintain or other green leaves—a process during which so much heat is developed that the hand cannot be held in the heap for an instant. Later the beans are dried in the sun, and are then ready for shipment. When roasted and split, or broken, they form 'cocoa-nibs.'

The cacao-tree must be grown where there is little or no wind, which would break the heavy seed-vessels. It succeeds best under a higher temperature than coffee, and requires a great deal of moisture and a considerable depth of soil—much greater than that necessary for sugar. It therefore generally grows nearer the equator than coffee, and mostly on low grounds. Like coffee, it is liable to suffer from direct exposure to the rays of the sun, and is mostly grown under the shade of other trees. During the present century the main area of production has shifted from tropical America to West Africa.

In the Gold Coast, cocoa has had a meteoric rise from nearly zero to easily the largest crop, and in Nigeria also it has become an important crop. Latterly production has been threatened by the spread of 'swollen shoot' disease, the only known remedy for which is to cut out the diseased trees.

Between the two world wars, consumption (largely in the form of chocolate as a confection) nearly trebled. World exports of cocoa increased from some 250,000 tons in 1913 to 736,000 tons in 1939. West Africa provided over two-thirds of the latter total, the Gold Coast contributing 38 per cent., Nigeria 16 per cent., French West Africa (mainly the Ivory Coast) 7 per cent., the French mandated territories in the Cameroons and Togoland 5 per cent., and the islands of Fernando Po (Spanish) and São Tomé and Príncipe (Portuguese) 3 per cent. On the other side of the Atlantic, Brazil, with 18 per cent., ranked next to the Gold Coast as a source of supply, while the Dominican Republic (4 per cent.), Ecuador and Venezuela (4 per cent.), and Trinidad and Grenada ($1\frac{1}{2}$ per cent.) made up the exports from Latin America and the Caribbean to well over a quarter of the world total.

During the Second World War, world exports dropped nearly 50 per cent., to a minimum of 389,000 tons in 1942; but immediately after the war they increased again (1946) to 650,000 tons, of which the Gold Coast still provided 38 per cent., Nigeria 17 per cent., and Brazil 20 per cent. By 1950 recovery to the 1939 peak level was almost complete. Most of West Africa's exports are classed as 'Ordinary', and most of the supplies from the other side of the Atlantic as 'Fine', these being the two recognised grades in the industry.

Both during and after the war, controls were widespread, and in British West Africa official buying and price fixing have been put on a permanent basis, with a view to regulating development. But so long as swollen shoot disease remains unconquered, the position is precarious—an unsettling factor not only locally but in world trade and industry. In 1952 it was officially stated that in the Gold Coast over 15m. trees had been destroyed out of an estimated total of 40m. trees affected, and in Nigeria, out of more than 6m. trees affected, upwards of $1\frac{1}{2}$ m. had been destroyed.

RICE. Rice is the characteristic grain-crop of the plains in the monsoon area of the tropical and sub-tropical parts of south-eastern Asia. There are many varieties of this crop, some of which require very different conditions from others; but those which are most abundantly produced not only demand a high summer temperature, but have to be grown in fields capable of being flooded at certain stages of their growth; and it is these conditions which are afforded in the great river deltas and low-lying seaboard tracts subject to inundation during the summer rains of the area referred to.

The fields in which the rice is grown are embanked to retain the water as long as may be needed, and where not sufficiently level by nature are carefully levelled by art; and if the rains or the overflow of rivers are not sufficient to inundate the fields, the necessary water must be furnished by irrigation. The amount of flooding required or capable of being endured varies at different stages of growth. While the seedlings are in an early stage of growth, two inches of water are ample; but when the stem is strong, high floods are almost unable to drown it. During flooding growth is astonishingly rapid, as much as nine inches having been known to be added to the height of the stalk in twenty-four hours.

From the highly peculiar conditions under which rice grows, it follows that where grown at all it is grown to the exclusion of almost every other crop; and outside of the regions above indicated, the cultivation of rice is for the most part locally restricted to small areas, presenting exceptional facilities for artificial inundation. There are, indeed, certain varieties of rice, known as upland or hill rice, which thrive on a drier soil, in India even at an altitude of 8,000 ft.; but these varieties occupy comparatively small areas.

Yet, notwithstanding this local restriction of the rice-crop, it forms the staple food grain of about one-third of the human race, and exceeds all other grain crops both in volume and in weight. No tropical grain yields so large an amount of food from a given area of land; and hence the lowlands of Asia adapted to this crop are the most densely peopled parts of the continent. Rice weighs only 45 lb. a bushel against wheat's 60 lb., but on world averages for the five years 1934-38, before the disturbance of the Second World War, an acre of rice yielded 35 bushels against wheat's 15 bushels—that is, two-and-a-third times as much by volume, and one-and-three-quarter times as much by weight. On this basis, though the area under rice (215m. acres) averaged only about two-thirds the area under wheat (320m. acres), the weight of the rice crop would be a sixth greater than that of wheat, as it actually was—149m. tons of rice compared with 128m. tons of wheat (F.A.O. returns).

Japan (at least until recently), the Philippine Islands, parts of the East Indies, and Indo-China are lands within whose borders the great bulk of the entire population live mainly on rice. In India and China there are certain regions, and these in many cases the most populous, where rice is likewise the mainstay of the inhabitants. Still, it is estimated that, in former British India as a whole, only about one-third of the population is rice-eating, and, since the former native states lie mainly outside of the regions suitable for rice-cultivation, it may safely be inferred that a smaller proportion of the inhabitants of those territories live on rice.

Relatively to this vast consumption, rice does not enter very largely into the commerce of the world. The great countries of Asia

for the most part supply their own wants as regards this commodity within their own borders, and the trade in rice is principally a home trade. The density of population in most of the great rice-producing regions of the world does not allow of any great surplus for Europe and America, and normally the supplies for these parts of the world are mainly obtained from the three comparatively small countries of Burma, Siam, and Cochin-China—the least densely populated of all the great rice-growing regions. Of the total export of rice formerly credited to India, between 80 and 95 per cent. was from Burma, until 1937 a province of India, although the rice-fields there cover only about one-sixth of the area of those of Bengal. Rice is grown here and there in southern Europe, above all in Italy (Piedmont, Lombardy, and Venetia), so that rice is among the principal Italian exports of home production. It is also cultivated in the United States, on irrigated land in California as well as in Louisiana, on the Mississippi delta, and in Arkansas and Texas.

A distinction should be drawn between the coarse rice which enters into international trade for industrial uses, such as the preparation of starch, and the smaller trade in finer qualities for human consumption by white races. Table rice for Britain thus comes from Spain, Australia, and India as well as from the great exporters.

MILLETS. This name is given to several grain-crops, the most important of which are tropical. The two kinds most largely grown are the Great Millet (*Sorghum vulgare*, Pers.) and the Spiked Millet (*Pennisetum typhoideum*, Rich.). They are both among the leading crops of India and form the staple food grains of the drier regions of both India and China. Great Millet is also largely grown in Africa under the name of durra. It is sometimes known as Guinea corn. Neither product enters largely into the commerce of the world. A species of sorghum is widely cultivated in the United States and elsewhere for green fodder. The so-called millets of the temperate zone, including *Setaria italica*, Beauv., agree only in yielding grain of a small size.

MINOR FARINACEOUS PRODUCTS. **Tapioca** is derived from the long tubers of the manioc plant (*Jatropha Manihot*, L.), a native of Brazil, but now largely cultivated elsewhere in the tropics of the Old World as well as the New. The tubers, before being subjected to heat and pressure, are highly poisonous, but the meal, a granular substance derived from them, and known as tapioca or cassava, according as it is the result of one or other mode of treatment, is wholesome and nutritious. This meal forms a staple article of food in Brazil and in many parts of tropical Africa, but normally it is imported into this country chiefly from Indonesia (Java) and from British Malaya, by way of Singapore. **Sago** is obtained from the pith of palms of the genus *Sagus*, principally *S. Rumphii*, Wild.

and *S. laevis*, Reinw., largely cultivated in the eastern half of the Eastern Archipelago, including Borneo, whence it is imported by way of Singapore in sacks made out of the leaves of the palm itself. So easy is the cultivation of the palm, a single family is able to attend to a plantation containing 400 trees. West Indian sago is the produce of cycads. **Arrowroot** is derived from various sources. That which is distinguished as the true arrowroot is obtained from the rhizome of *Maranta arundinacea*, L., a native of tropical America, but now cultivated also in the Old World. This arrowroot is chiefly obtained from the West Indian island of St. Vincent. Other kinds are derived from India and elsewhere.

YAMS are the thick tubers of several species of *Dioscorea* which send up long slender annual twining stems. The tubers vary in weight from 1 lb. to 100 lb. according to the species. When cooked the tubers acquire a mild taste like that of a potato and form the staple food of native races in many parts of the tropics—notably the wetter parts of West Africa and the South Sea Islands. They should not be confused with the **Sweet Potatoes** (*Ipomoea Batatas*) also grown in tropical and warm temperate lands and eaten in the same way as potatoes.

SUGAR-CANE. The sugar-cane belongs botanically, like the cereals, to the family of the grasses, but its seed or grain is commercially of no value, and the plant is cultivated solely for the sake of the juice which is found in its stem, and which yields sugar. It is a tall plant, growing to the height of from ten to fifteen feet, and some of the stalks attain a thickness of more than an inch. Every year these stalks are cut down just before flowering, but the root-stock is perennial, and continues to throw up fresh shoots every year in sufficient quantity to be remunerative for thirty years in succession, though the usual rule is to renew the plants after five years. The range of the sugar-cane in latitude is wider than that of coffee, but not so wide as that of tea. In the northern hemisphere it is grown successfully to the north of lat. 37° in the south of Spain, and in the southern hemisphere, in Natal and New South Wales, to about lat. 30° S. A moist soil being required for sugar-cane, the situation in which it is grown is very different from that of tea or coffee, but with too much moisture the juice will be watery.

Originally a product of Eastern Asia, the sugar-cane was made known in the West by the Arabs, who appear to have introduced it first into Egypt, then in the ninth century into the Mediterranean islands, and later into Spain, the only part of Europe where it still flourishes. To-day the sugar-cane is cultivated in all tropical and many sub-tropical countries. The largest producer of cane sugar for export is Cuba. In the pre-war quinquennium 1934-38 its average annual production was over 2.6m. tons, or one-sixth of the world average of 16m. tons; during the war it went up to 4m. tons,

and in 1951-52 topped 7m. tons, out of an estimated world total of over 21m. tons. Production is almost entirely for export, and the difficulty is to find markets for all the available supplies, especially under post-war financial conditions. Before the Second World War, Cuban sugar provided about one-fourth of the total world exports of some 11m. tons, and after the war its trade pre-eminence was still more marked, 43 per cent. of the total world exports of 12½m. tons in 1951 being from Cuba.

These figures relate only to centrifugal sugar. Including non-centrifugal (*gur*), India's pre-war production was even larger than Cuba's—nearly one-fifth of an average world total of all kinds of cane sugar estimated at over 18m. tons. But this pre-eminence has not been maintained on the known figures of production; and in any case, as India consumes practically all her production, her part in world trade in sugar is negligible.

No other country approaches India and Cuba in production. In 1934-38 the seven countries next in order—Java, Formosa, Brazil, Philippines, Hawaii, Puerto Rico and Australia—provided severally from 7 per cent. down to 4 per cent. of the world total. All these countries except Brazil exported the great bulk of their cane sugar. In several other countries production and export, though relatively small, are actually substantial and are a main factor in the local economy, notably in the Dominican Republic, Peru, Mauritius, most of the British West Indian Islands, and British Guiana; while in the United States from 300,000 to 400,000 tons are produced in Louisiana and Florida.

The effects of the war were especially marked on the Far Eastern sources of supply—Java, the Philippines, Formosa, etc. For the time being they disappeared from world statistics, and their post-war recovery to earlier standards of production and trade was delayed by other adverse conditions.

THE SUGAR INDUSTRY. Sugar, now regarded as a necessary of life by the very poorest in almost all parts of the world, was unknown to the classical nations of antiquity. Even about four hundred years ago refined sugar, in the form of loaf sugar, was still unknown. The invention of the process is ascribed to a Venetian about the end of the fifteenth or beginning of the sixteenth century. As late as the beginning of the eighteenth century the total amount consumed in Europe in one year is estimated to have reached only about 50,000 tons. Before the Second World War the United Kingdom alone consumed some 2m. tons annually. Apart from certain kinds of timber, cane-sugar is, next to rice, the bulkiest of tropical commodities in proportion to its value, and demands a great amount of shipping. It should be mentioned that the consumption just mentioned is exclusive of molasses as well as of **glucose**, a kind of sugar derived from the starch of maize or potatoes, and used as a

sweetener in jam-making, in brewing, as an invalid food, and for many other purposes.

Down to the nineteenth century the sugar-cane was almost the sole source of supply of the sugar consumed in Europe. Since then the sugar-beet has become a formidable rival. The presence of sugar in beet-root was discovered by a Berlin apothecary named Marggraf, as far back as 1747. Before the close of the same century another Berlin chemist, named Achard, devised a method of extracting the sugar from beet; but the first attempts to do this were not commercially successful. At a later date great improvements were introduced in the method of extraction by the French Comte de Chaptal, and after 1820 the making of beet-sugar became firmly established in various countries in Europe. As time went on, production increased until in 1913 the world's supply was derived almost equally from the two sources. It will be instructive to compare the advantages of these rivals.

On the side of sugar-cane are easy culture in tropical and sub-tropical climates where labour is at its cheapest; natural richness in sugar; and a perennial root stock. Beet suffers under the disadvantage of requiring high cultivation (more especially plentiful supplies of potash manures), of requiring to be re-planted year by year, and of being grown where labour is relatively dear. On the other hand, as a result of modern selection, a given weight of sugar-beet is now actually richer in sugar than a corresponding weight of cane. Beet has the advantage of being grown where population is dense, and where accordingly the market is close at hand both for the raw material used in the refineries and also for the manufactured product; where, too, in consequence of that density of population, manure is abundant, or the advanced state of commerce renders it easily procurable; and where the abundance of capital, and the consequently low rate of interest on money, favours the erection of the best machinery for dealing with the raw material. Moreover, it has the further important advantage of yielding a refuse material of much higher value than that obtained from the sugar-cane. The canes after being deprived of their sugary juice are chiefly used for fuel; but the refuse beet, the beet-pulp, as it is called, besides being a useful manure, especially as returning potash to the ground, is a valuable food for cattle—a circumstance of special importance in thickly peopled countries.

There are other indirect advantages in connection with the sugar-beet industry. The extraction and refining of the sugar are conveniently complementary to the growing of the beet both as regards place and time. The amount of waste in the raw material makes it important to have the factories near the farms, all the more since that waste matter ceases to be waste when returned to the farms. That favours the establishment of at least one manufacturing

industry in country districts. At the 1907 industrial or occupations census of Germany, 40 per cent. of the refinery employees were in towns of less than 2,000 inhabitants, and an additional 33 per cent. in towns of 2,000 to 20,000. Then the factory work is confined to three months in the year, September to December, when agricultural work is slack, so that the agricultural industry can easily spare labour for the factories, all the more easily since the refinery labour is to agricultural only in the ratio of 2 : 13.

The sugar-beet industry enjoys further advantages in the methods and machinery used for extracting sugar from the beet. The roots containing the sugar are first treated in one of two ways, either of which extracts from their substance a larger proportion of the juice contained in them than is usually derived from the sugar-canes. One method is to subject them to the action of powerful presses; but a still better method is that known as the diffusion process, the invention of a German named Robert, but improved and first made practically useful in France (by Charles, and afterwards by Peret of Roye). According to this process slices of the beet-root are subjected to the action of hot water either in a number of different tanks or in one continuous cylinder, but in either case in such a manner that the water ultimately gets thoroughly saturated with juice. The after-treatment of the beet-juice differs in some respects from that of cane-juice, but is in the main similar. The improvements in the cultivation and treatment of sugar-beet are such that whereas in 1836-37 18 cwt. of beet were required to produce 1 cwt. of raw sugar, now the world average is only 8 cwt. (see page 210).

In the case of the sugar-cane, the stems of the plant are as a rule merely crushed between rollers which still leave in the cane a considerable proportion of the juice. The juice that is pressed out is boiled and otherwise treated, part of the substance then forming the crystals of sugar, while the remainder flows away in the form of a syrup known as molasses. From the country of production cane sugar is usually exported in an unrefined condition, in which it is called raw sugar, and the raw sugar is further treated and refined, more syrup flowing away during these further processes. An economy has been effected by a change of system in some cane-growing districts. Instead of each planter extracting the sugar from his own cane, different estates are connected with a single sugar-factory, the juice from the canes being pumped through pipes leading to reservoirs belonging to the factory. This is known as the *usine* or factory system. Even this method does not produce the most economical results unless the separate estates are large enough to be equipped with the best crushing machinery. Otherwise it is found best to convey the cane itself to the central factory to be crushed there.

An inexact but instructive indication of the comparative yields of sugar from cane and beet is provided by the *International Yearbook*

of *Agricultural Statistics*, issued by the Food and Agriculture Organisation of the United Nations. According to the data there set out, in the pre-war quinquennium 1934-38 the world production of sugar beet averaged 75m. metric tons a year and the world production of beet sugar averaged 9.5m. metric tons. Provided that no substantial part of the beet was used for other purposes about 8 tons of it were needed to produce one ton of beet sugar. During the same period, the world production of sugar cane averaged 168m. metric tons a year, and the world production of cane sugar averaged 16.5m. metric tons. Provided again that no substantial part of the cane was used for other purposes, about 10 tons of it were needed to produce one ton of cane sugar.

During the present century, scientific research has led to improvements in growing and extracting cane sugar as well as beet sugar, and the Commonwealth Economic Committee, in a post-war survey of plantation crops, asserts that cane sugar can usually be produced more cheaply than beet sugar, which would have difficulty in competing with it without the support of subsidies or protective tariffs. This support has long been given, not only in countries whose traditional economic policy is protectionist, but in the United Kingdom. Sugar beet is chiefly grown in Europe, and especially in Germany, France, Czechoslovakia, the United Kingdom, and other highly industrialised countries, which favour it with the double object of ensuring home supplies of sugar and encouraging agricultural industry. National support has been supplemented by elaborate international agreements, affecting both beet sugar and cane sugar, and aiming at the control of production and prices in face of supplies tending to overtake demand.

As already stated, the production of beet sugar increased until in 1913 world supplies rivalled those of cane sugar. Between the two world wars cane sugar regained the predominance. Of the world total production of sugar averaging some 26m. tons in the years immediately preceding the Second World War, cane sugar accounted for over 60 per cent. During the war, world production declined to about 20m. tons, the decline of beet sugar in the war-ravaged countries of Europe being especially marked. But there was rapid recovery in the years following the close of hostilities—more rapid in the case of cane than of beet—and by 1948-49 total production had regained the pre-war level. By 1951-52 it was nearly 30 per cent. higher than pre-war, having risen to 32.4m. tons. Cane sugar accounted for a somewhat larger share than before the war.

Besides the two great sugar-producing plants, sugar is obtained in greater or less quantity from various other sources. In the eastern parts of Canada and in the north-eastern states of the Union, sugar is largely obtained from a juice which flows out on tapping the trunk of various species of maple and above all the sugar-maple

(*Acer saccharinum*, Linn.). From this source is obtained a small proportion of the native-grown sugar of the United States, but one which has a special use as a sweetmeat or as syrup. In tropical countries sugar is largely obtained from various species of palms—in India from the Indian date palm, the Palmyra palm, the coconut palm, the toddy palm, and the sago palm.

CINCHONA. Cinchona is the name of a Linnæan genus of tropical trees, several species of which yield a bark highly prized in medicine, chiefly as a sovereign remedy for the malarial fevers incident to tropical climates. The bark yields extracts, the best known of which is quinine. Compounds from these extracts are also used. The species of Cinchona are all natives of the eastern slopes of the Andes, from about 7° N. to 22° S., occupying, generally in scattered groups, a belt of from about 3,000 to 10,000 feet above sea-level, a belt in which they are exposed to copious rains, enjoy a tolerably constant temperature, and plenty of sunshine. The species most valued for their bark include *Cinchona succirubra*, Pav., yielding the red bark of commerce; *C. calisaya*, Wedd., and *C. ledgeriana*, Moens, yielding the more valuable yellow bark; and *C. officinalis*, L. They flourish best within eight or ten degrees of the equator at from 4,000 to 7,000 feet above sea-level, where the mean temperature is from about 55° to 70° F. In higher latitudes they are confined to a lower elevation.

The great value of this bark led to numerous attempts to introduce the trees into other parts of the world. Originally, the region from which it was introduced into Europe belonged entirely to the domain of the old Empire of Peru, and subsequently to the Spanish viceroyalty of Peru; and hence it became known by the name of Peruvian bark. After the establishment of the various South American republics, that of Colombia furnished the chief supply. The first attempts to introduce the tree into tropical parts of Asia were made by the Dutch. The first tree was introduced into Java in 1852, and a few years later the cultivation of the cinchona was a successful government industry on that island, where it is now prosecuted by private individuals as well as by the government. To India the tree was brought direct from South America by Mr. (afterwards Sir) Clements Markham in 1860. A government cinchona plantation was soon after established on the Nilgiri Hills, and a second was afterwards set going in Darjeeling, in lat. 27° on one of the rainiest parts of the Himalayan range.

But it was the Ceylon plantations which first greatly affected the international commerce in this bark and its price. Down to about 1880, Colombia remained the chief source of supply for the London market; but so rapidly was cinchona cultivation extended in Ceylon that the British imports of the bark from that country increased from 7,452 cwt. in 1881 to over 115,000 cwt. in 1886. Later, the Colom-

bian supply dwindled to insignificance, and the supplies from Ceylon and India also fell away, partly on account of disease and partly because prices ceased to be remunerative. Before the Second World War, the supreme source of supply was Java, which in some years provided over 90 per cent. of the world total. A large proportion of the United Kingdom import was in the form of quinine and quinine salts from the Netherlands, the imports of cinchona bark being only a fraction of what had been received from Ceylon in 1886. With Java and the Netherlands both in enemy occupation during the war, cinchona and quinine were in very short supply. Both then and for a time after the close of hostilities, the United Kingdom was dependent on spasmodic imports from different sources, including not only South America but Central America, the Belgian Congo, and (in 1946) the Union of South Africa and British Malaya. In 1947, imports were up to the pre-war level in quantity, amounting to 16,000 cwt. of bark and over 2m. oz. (1,150 cwt.) of quinine and quinine salts; but since then they have fluctuated considerably. Balancing the imports of quinine and its salts are exports under the same name, not merely re-exports, but classed as exports of British manufacture.

TROPICAL VEGETABLE FIBRES. Of these the most important (apart from cotton) is **jute**, which is derived from the bast chiefly of two species of a genus of plants known to botanists as *Corchorus*. These are slender-stemmed annuals, from about eight to twelve feet high. The cultivation of the plant on a great scale for the sake of the fibre is almost confined to northern and eastern Bengal, especially the latter, in the Ganges Delta. Here the annual production ranges between 1m. and 2m. tons; in none of the few other countries in which jute is grown does the production amount to more than a few thousand tons. In Bengal it grows in every variety of soil, but by preference on the alluvial sand-banks thrown up by rivers, for which situation it is peculiarly adapted by the fact that, except in the early stages of growth, it can stand heavy flooding without injury. The fibre, which is extracted from the stem by various processes, including that of retting, has long been woven on Indian hand-looms into gunny cloth—‘the brown paper of the wholesale trade’, as it has been called. Wherever and however made, the cloth is almost universally used as sacking for agricultural produce; no satisfactory substitute has yet been found, and though the bulk handling of grain in the great wheat-growing countries has lessened the demand to some extent, jute still plays an essential part in agricultural industry throughout the world.

Till about 1835 the use of this material in weaving was almost confined to India; then it began to be imported into Dundee, where it has risen to be the chief article used in spinning and weaving. For a time Dundee was the only seat of jute-factories, but the industry

later spread to other towns of the United Kingdom (especially to such as are also engaged in the linen industry), and factories were established on the Continent and in India itself. The Indian factories are almost all confined to Bengal, and indeed to the immediate neighbourhood of Calcutta, jute being the Bengal industry which rivals that of cotton in Bombay. Complications have followed the partition of India. The jute-growing lands of Eastern Bengal, forming about 75 per cent. of the area then under jute in Bengal, are now in Pakistan, which is developing an export trade through Chittagong, whereas nearly all the factories, as well as the traditional port of export (Calcutta), are in India proper. While the two countries were one, all the supplies of raw jute naturally went to the neighbourhood of Calcutta. The interposition of a frontier created a barrier which, in the absence of a spirit of co-operation between the two governments, has revolutionised the course of trade and industry locally, and been a very upsetting factor in its world aspects.

Some compromise has been necessary between India and Pakistan, but each is trying to become more self-contained in respect of jute, India seeking to increase its output of raw material to feed its mills, while Pakistan has set about building new mills to utilise its supplies, as well as expanding its port facilities in East Bengal. Formerly, as indicated, the Pakistan acreage under jute greatly exceeded the Indian, but the total is now more evenly divided. Joint production, before partition, reached a peak of 2·35m. tons in 1940. In later years it sank to round about half that quantity, but in 1951 was estimated at 1·8m. tons, of which Pakistan's share was roughly 60 per cent.

The industry is one of the first importance, commercially, to both India and Pakistan, and the United Kingdom is easily the best customer of both. In 1938 it imported from an undivided India nearly 200,000 tons of raw jute and nearly 100,000 tons of piece goods, sacks and bags. During the war and after partition the Dundee factories were often on short commons. In 1952 the imports of raw jute were 100,000 tons, valued at nearly £14m., and of jute manufactures 56,000 tons, valued at £16m.; the quantities in both cases being about half the pre-war figures. The raw material came almost wholly from Pakistan, the manufactures predominantly (80–90 per cent.) from India. Before the war, Germany was the second largest importer; its place has since been taken by the United States, but France and Germany and Belgium are all important markets.

Throughout the war and after, purchases for the United Kingdom were made in bulk by a Jute Control; and to avoid complaints of Indian competition in the home market, the imports of jute manufactures were sold at British factory prices. Jute spinners have

been experimenting with synthetic fibres, with promising results; but no entirely satisfactory substitute for jute has yet been found.

Jute yarn, either alone or in combination with other yarns, is now also employed in the manufacture of various other fabrics, such as carpets, furniture-coverings, curtains, and even plushes and velvets.

Next in importance to jute among tropical fibres in European commerce is **Manila hemp**, so called from the chief place of export. It is obtained from the long leaves of *Musa textilis*, Nees, a plant belonging to the same genus as the banana and plantain, found wild on the Moluccas and Philippine Islands, and cultivated almost exclusively on the latter. Along with constant humidity and a high but fairly regular rainfall it needs a well-drained soil, and is often put on steep mountain sides. The fibre is from six to nine feet in length, and is separated from the leaf by hand-labour or by mechanical strippers. Though more difficult to work and more brittle than hemp fibre, it is capable of being made into ropes of great tenacity and endurance, and it is very largely exported for that purpose. The finer fibres are woven by the people of the Philippine Islands into delicate tissues, and in Europe they are likewise used (often in combination with silk) in making curtains, coverings for furniture, and other fabrics.

In Eastern countries (India, China, Japan, and the Eastern Archipelago) fibres derived from the bast chiefly of two varieties of *Bahmeria nivea*, Hook., a species of plants belonging to the nettle family, have been used from the earliest times in spinning and weaving. The fibres, known in India as **rhea**, in the Malay Islands as **ramie**, and to Europeans by the name of **China grass**, are pre-eminent amongst vegetable fibres for strength, fineness, and lustre, and produce an almost silky-looking fabric, called China cloth or grass cloth, which in China is very generally used for the making of summer clothing. Its various qualities render it fit for being used in making, besides ships' cables, all sorts of woven fabrics, from the coarsest to the finest—sail-cloth, table-linen, 'alpaca,' velvet, and even lace and cambric. The chief obstacle to its use at present is its high price, arising from the difficulty with which the fibre is separated. The fibres are attached to the core of the stem of the plant and to one another by a gummy substance which cannot be removed by the ordinary process of retting and has to be abstracted by treatment with chemicals. When examined under the microscope the individual fibres are seen to be interrupted at intervals by enlarged nodes, making the fibres difficult to work.

Since about 1880 a fibre known as **sisal** has been largely used (first in America) for the making of binder-twine. It is derived from the fleshy leaves of various species of *Agave*, but chiefly the *Agave rigida*, Mill., a native of Yucatan, which has been widely introduced into other parts of the tropics with a similar climate, notably East

Africa—where Tanganyika is now the world's largest producer—and Indonesia. Even before the Second World War the production and exports of sisal exceeded those of Manila hemp, and during the war, when the Philippines were in Japanese hands, sisal went further ahead, till at the half-century world exports totalled 280,000 tons, of which Tanganyika supplied nearly 120,000 tons.

Of other tropical or sub-tropical fibre-plants none has, as yet, attained any considerable place in international commerce. One of them, a leguminous or pod-bearing plant, *Crotalaria juncea*, Linn., yields from its bast the **sunh-hemp** of India, not unlike jute; its annual post-war production is estimated at 90,000 tons. In the same country the *Hibiscus cannabinus*, Linn., a member of the same family as the cotton plant, is largely cultivated, especially in the north, for its fibre, which is also obtained from the bast, and is known as **Deccan** or **gambo-hemp**. Several trees belonging to the same family furnish a soft silky wool, which, like the true cotton, is an investment of the seeds, but which, being too short for spinning, is used for stuffing cushions and other similar purposes. These are known as **silk cotton trees**, and the most important are *Bombax Ceiba*, Linn., a native of tropical America, *Bombax malabaricum*, DC., a native of India, and *Eriodendron anfractuosum*, DC., a native of India and the Eastern Archipelago, from which latter region the product of this tree has been introduced into commerce by the Dutch under the name of **kapok** or **vegetable down**. On account of its extreme buoyancy it is used in making life waistcoats. The fibres of the leaves of the screw-pine, *Pandanus odoratissimus*, Linn., a native of southern Asia, Madagascar, and the islands of the Pacific, enter into commerce under the name of **vicua**, or **vacoua**, as a material for coarse sacking. Those from the outside of the stem of the palm, known to botanists as *Attalea funifera*, Mart., are exported from Brazil, under the name of **piassava**, as a material for brushes and brooms. Under the same name the fibres of *Raphia vinifera* are exported from West Africa. The ubiquitous coconut palm furnishes, among its numerous other products, the fibre called **coir**, which is commercially by far the most important of all these minor fibres. The fibre forms a thick matting on the outside of the nut, and after separation and treatment is exported as a material not only for brooms and brushes, but also for the making of door-mats, socks, and even stair-carpets, as well as for various other purposes. Sometimes there are local manufactures.

TROPICAL FRUITS. Oranges, limes, dates, and some other fruits are all imported into the United Kingdom and other parts of the temperate zone more or less from the tropics, but the supply from within the tropics is in most cases less than the supply from without. The **banana** is the only fruit which enters into world commerce mainly from the tropics, and this is a trade that has grown important as the result of increased knowledge of cold storage and

careful organisation. They are the product of the large plant known to botanists as *Musa sapientum*, L., and its varieties, including a hardy dwarf variety known as *M. Cavendishii* or *chinensis*, suitable for cultivation in the temperate zone, and now largely cultivated in the Canary Islands. All the varieties require high temperatures, a great deal of moisture, and a deep soil. When these conditions are satisfied they are grown almost universally in the tropics in small plots belonging to the peasants. Central America (above all, Costa Rica), Colombia, the West Indies, the Canaries, and Cameroons are the principal parts of the world in which cultivation is carried on extensively, as a plantation industry for export. The United States, the United Kingdom, and certain European countries are the principal markets. The trade has grown to enormous proportions since the construction of special steamers with the requisite cold storage where the bananas can be kept at the exact temperature of 52° F. The bananas grow in 'hands,' of 10-12 fingers along a main stem forming a 'bunch.' The average 'bunch' is over 100 bananas, each plant yielding one bunch. Other species of *Musa*, including *M. paradisiaca*, L., which yields the plantain, are also grown to a large extent in the tropics as food, but do not enter into world commerce. The name plantain is, however, loosely used in many parts of the world as practically synonymous with banana.

The import into the United Kingdom increased from about 1½m. bunches in 1900 to upwards of 22m. in 1938. They were nearly all for the home market, and reckoning only 100 bananas to the bunch the average annual consumption was 50 per head of the population. The weight of the 22m. bunches, as given in the trade returns, was 6½m. cwt., so that on a world-wide range of supplies the bunches averaged between three and four to the cwt., or about 70 to the ton.

For three years during the Second World War, 1942-3-4, the importation of bananas into the United Kingdom was prohibited, and later the Ministry of Food bought all supplies till private trading was again allowed in 1953. In 1952 imports were nearly 3½m. cwt. (over half the 1938 import), almost wholly from the British West Indies, Cameroons, and the Canary Islands.

RUBBER was formerly known as caoutchouc or india-rubber. Of the older names, the first is a South American name, and suggests the region whence knowledge of the substance was introduced into Europe, and whence still come limited supplies. Columbus, on his second voyage (1493), noted it as being used in Haiti for the making of balls. Torquemada mentions in 1615 that it was then derived from a Mexican tree, and used by the Spaniards to waterproof their cloaks. The Portuguese found it in use at an early date in Brazil for the making of syringes (whence its Portuguese name of *seringa*). But the substance and its uses first became generally known in

Europe through a paper read to the French Academy by La Condamine in 1736. For more than eighty years after that almost its sole use in Europe was for the purpose which the second name suggests, namely the rubbing out of pencil-marks. At the present time it would be difficult to say how small a fraction of the consumption of rubber that use represents. The 'India' prefixed to the term 'rubber' indicates the source from which the chief supplies of the material were then obtained. The first important extension of the use of rubber was due to the invention in 1823 by Mackintosh of the waterproof fabric named after him. A still greater extension followed when Goodyear in America in 1842, and independently Hancock in England in 1843, discovered the method of hardening caoutchouc by treating it with sulphur. This is known as the process of **vulcanising**. A small proportion of sulphur (5 to 7 per cent.) incorporated with the rubber makes a compound adapted for a great variety of mechanical purposes. A larger percentage (39-84) makes the equally familiar hard black compound known as **ebonite**. What above all has stimulated the modern growth of the rubber industry has been the 20th century development of motoring and aviation. It has been estimated (1948) that the pneumatic tyre accounts for from two-thirds to three-fourths of all the rubber used in the world.

Rubber is the coagulated latex or juice derived from a variety of trees, all tropical. To prevent putrefaction the coagulation must be effected within about 24 hours of the collection of the juice. For many years the largest supply was obtained from trees of the allied genera *Hevea* and *Micrandra*, growing in the Amazon valley, in Brazil, Bolivia, and Peru, not in clumps, but widely scattered amongst a great variety of other trees, as is usual in well-watered parts of the tropics. The species from which most was obtained is the *H. brasiliensis*, Müll.-Arg. (*Siphonia elastica*, Pers.). Rubber from all these trees is known from the place of export as **Pará rubber**. The trees yielding the best juice are those growing on tracts of land which are annually flooded. Those growing where the roots are always submerged yield too watery a juice, and those that grow on higher ground beyond the reach of floods a juice too viscid. Another Brazilian tree, *Manihot Glaziovii*, Müll.-Arg. (an ally of the shrub yielding tapioca), furnished Ceará rubber, which owes its commercial name to the province from which it is derived. Rains are occasionally plentiful in its habitat, but the region is exposed to prolonged periods of drought. In Central America and the northern parts of South America, an inferior caoutchouc is obtained from *Castilloa elastica*, Cerv. In India, rubber has been obtained from a species of fig, *Ficus elastica*, Roxb. (Assam rubber); in Borneo, from a species of Willughbeia; in other parts of the Eastern Archipelago, from *Urceola elastica*, Roxb.; in Africa, principally from various species of twining plants belonging to the genus *Landolphia*, but

also, in Lagos and other parts of West Africa, from *Funtumia elastica* (= *Kickxia elastica*, Preuss). All the species mentioned are trees, most of them confined to latitudes well within the tropics, the only exception being the *Ficus elastica*, which, however, grows in a part of India with a characteristic tropical climate.

Largely owing to the practice of what the Germans call 'robber economy' (whereby the rubber-bearing trees are ruthlessly cut down and killed in order to obtain the maximum yield), wild rubber has come to form a very small percentage of the world's supply. The bulk of the supply is now obtained through the produce of regular plantations, in which it is possible by careful tapping to obtain a steady supply of juice from the same trees for many years in succession, and to effect other economies not practicable by the old mode of collection. Experiments began to be made with both Pará and Ceará rubbers as far back as 1876 and 1877. Through the authorities of Kew Gardens both trees have been introduced into most suitable parts of the tropics in both the Old World and the New. At first the progress of rubber-planting was slow. The Hevea rubber tree takes ten years to mature, and at the end of last century it was still considered doubtful whether plantations with expensive European company management would pay. But the foresight of business men has been justified. In 1913, the year before the outbreak of the First World War, nearly half the total production of 101,000 tons was plantation rubber. In 1923, five years after the close of that war, the total production was estimated at 410,000 tons, more than 90 per cent. being plantation rubber.

Before the Second World War, in the five years 1934-38, total production averaged just on a million tons a year, of which only about 2 per cent. was wild rubber, coming mostly from Brazil. All but a still smaller percentage of the plantation rubber was produced in Asia—more than three-fourths of it in Malaya (43 per cent.) and the Dutch East Indies (36 per cent.), while Ceylon, Siam and Indo-China between them furnished another 15 per cent. In the early stages of the war, production was intensified; in 1940 it amounted to over 1,400,000 tons. World totals for the later years of the war are not available, owing to the Japanese occupation of the principal rubber-growing countries; but in 1942 Ceylon's production reached 116,000 tons (nearly double the pre-war average), and in tropical Africa it rose to 40,000 tons (over five times the pre-war average). The production of wild rubber also increased—from 20,000 tons (pre-war average) to nearly 50,000 tons.

This increased production could not make up for the loss to the world at large of the main supplies of rubber. To meet the shortage, synthetic rubber was manufactured on a large scale in the United States, and both the quality and the price of the manufactured article made it a formidable rival to the natural product. Before the

War, world output of the synthetic product was estimated at 68,000 tons; in 1944 it was over 900,000 tons. To ensure maintenance of the new industry for possible future need, it was made obligatory in the United States to include a certain percentage of synthetic rubber in any rubber content of manufactured articles. The effect on the plantation industry was all the more marked because, before the Second World War, the United States bought about half the total world supply of rubber, the other half being absorbed mostly in Europe (the United Kingdom 15 per cent.), Japan and Canada. The limitation of the United States market for plantation rubber naturally had a depressing effect on prices, and that at a time when the rehabilitation of the industry in the Far East involved largely increased costs. Before the war rubber fetched from 7d. to 8d. a pound on the London market; when the market was freed from control after the war, the price was 9d. a pound, rising later to 1s. Happily the damage suffered by the plantations during the Japanese occupation was much less than had been feared; production made a rapid recovery, and the post-war problem was not one of shortage but of the absorption by industry of all the available supplies, natural and synthetic. The Korean War and the rearmament programmes of the great powers transformed this situation, and new demands sent up the price to 2s. 9d. per lb. in 1950 and 4s. 3d. per lb. in 1951, only to decline heavily again in the following year, when demand eased off. In 1951 the area under plantation rubber throughout the world was variously estimated at from 9½m. acres to 11m. acres, and world production at about 1·9m. tons, while the production of synthetic rubber exceeded 0·9m. tons, so that there was a total of 2·8m. tons to be absorbed by manufacturing industry or go into stock-piles.

These post-war developments only serve to illustrate the varied conditions which have been experienced from time to time in marketing the supplies of plantation rubber. From the early years of the present century, with supplies increasing by leaps and bounds, while demand also increased widely but erratically, there were periods of under-production and over-production, of booms and slumps, with the latter predominating. In 1909-10 the British import price rose to nearly £30 per cwt. (over 5s. per lb.); in 1913 it had fallen to £13 per cwt. (just under 2s. 4d. per lb.). Another boom after the First World War was followed by another slump. Over-production was averted by restricting output in the British rubber-growing countries. Later the restriction was removed, and in 1931 the price of rubber fell to less than 2½d. per lb. An International Agreement to regulate both production and export came into force in 1934, but it could not be carried out during the war, and though in the United Kingdom the Ministry of Supply was the sole importer of rubber from 1941 to 1946, free marketing was permitted again in 1947.

Gutta-percha is the hardened juice of several other tropical trees of the family of Sapotaceæ. The chief supply in this case comes from the East Indies. Formerly, that known to botanists as *Dichopis Gutta*, Benth., furnished the bulk of the supply, but this tree was so ruthlessly destroyed in obtaining the juice that it was almost exterminated and the genus *Payena*, especially *Payena Leerii*, Kurz, now contributes most of the product. Gutta-percha is used for many of the same purposes as rubber, and is capable in many respects of the same treatment. Mixed with carbon, it can readily be vulcanised like rubber, by the addition of sulphur, either to the soft or hard state. The former practice of destroying the trees to get the juice is now largely given up. They may be tapped and preserved like rubber trees. Another variety of gutta-percha, known as *balata*, is obtained from South America, mainly British Guiana, and is the product of another member of the Sapotaceæ, the bullet tree *Mimusops balata*, Crueg. With the increasing use of rubber from *Hevea brasiliensis* the use of other types has decreased.

COMMODITIES (*continued*)

I.—D. Products of Various Climates

VEGETABLE OILS, OIL-SEEDS, AND OIL-CAKE. Almost all vegetable oils are extracted from the fruit or seed. The plants supplying oil vary widely in their character, ranging from small herbs to tall trees. Almost all of them belong to warm countries, that is to say, either to tropical lands or the warmer parts of the temperate zone, or if they are not confined to these regions, are there of most importance for their oil. Oil has been extracted on a commercial scale from thirty or more trees and plants. The most important commercially are the coconut palm, the oil palm, groundnuts, linseed, soya beans, and cottonseed, which furnish 90 per cent. of the international trade in vegetable oils. Other important sources are the olive, rapeseed, sesame and sunflower seed, castor, tung, and perilla.

Two of the chief uses of almost all vegetable oils, except drying oils, are the manufacture of soap and the manufacture of margarine and other butter substitutes. Some vegetable oils, such as olive-oil, groundnut oil, poppy, sesame, and cotton-oil, are largely used as table oils for cooking, preserving, &c.; others, including rape, cotton, and olive, are used for lighting, though for this purpose they have largely been replaced by mineral oils; others, such as rape, hemp, and palm-oil, are employed in lubricating machinery; others are used in medicine and perfumery; others in making candles; others, known as drying oils, of which linseed is the most important, in mixing colours for painting, as well as in various manufactures.

Olive oil, though not the most important commercially, is the finest of the edible oils. The first crushing gives the highest grade oil, which does not need refining. Further crushing yields oil for soap-making and other industrial uses. The yield of oil is about 15 per cent. In the first half-dozen years after the Second World War, the production of olive oil in the main producing countries averaged 760,000 tons, representing, at the usual rate of extraction, over 5m. tons of olives. In addition, the world crop includes a considerable quantity of olives grown for direct consumption; in California, for instance, table olives are grown in at least the same quantity as olives for oil. Crops vary greatly from year to year, and so, naturally, does the production of oil, which in the half-dozen years

already quoted ranged from less than half-a-million tons to well over a million tons, and has since reached a new record of nearly $1\frac{1}{2}$ m. tons.

The olive tree, originally a native, in all probability, of western Asia, is suited rather to a warm temperature than a sub-tropical climate, with dry summers, and the site best suited to it is that which has a dry and, above all, a gravelly limestone soil, and is well sheltered. These needs are met in many parts of the Mediterranean region (including Portugal), throughout which (except in Egypt) the tree is highly characteristic. Indeed, it may be fitly taken as marking both in altitude and in latitude and longitude the limits of this type of climate in different parts of the world, the tree having now been introduced wherever that type of climate prevails.

The number of olive trees in Spain is estimated at over 200m. (nearly one-third of the world total), and in Italy 160m. In Spain there are extensive forests of it on the southern slopes of the Sierra Morena and on a tract fifty-six miles long in the upper part of the Guadalquivir valley, east-north-east of Cordova. In Italy its principal seats are Apulia, the western seaboard of Calabria, Tuscany, and the west side of the Gulf of Genoa. In France the area (in the lower part of the Rhone valley) devoted to it is much smaller, but the cultivation is more careful. In comparatively recent years, the Tunisian Sahel, an area of about 230 square miles, with Sfax as its chief port, has become an important source of supply. There, on the estates producing the best quality, it is planted in the ratio of only about $6\frac{1}{2}$ to the acre, whereas in Spain and Italy the ratio is as much as 50 to 110 to the acre. It is a slow-growing tree, taking from fifteen to twenty years to attain its maximum yield, but thereafter giving its fruit for centuries.

In the Black Sea region the distribution of the olive illustrates in an interesting manner the influence of climate. The tree is absent from the south of Russia, except on the southern slopes of the Yaila mountains in the Crimea, which afford the necessary protection against cold northerly winds. Under the shelter of the Caucasus Mountains it occurs in Trans-Caucasia, where it grows both wild and under cultivation in many districts. In the north of Asia Minor the olive thrives admirably along the whole coast from Trebizond to Samsun, and in ancient times extended to Sinope; that is, it occupies or once occupied the whole of that part of the coast looking north-eastwards and participating in the shelter afforded by the Caucasus Mountains. It is excluded, however, from that part of the coast which looks north-westwards and is liable to be swept by cold winds from southern Russia.

The olive tree is grown in many other parts of the world, but in none of them is olive-oil a product of outstanding importance. In 1945-51 Spain and Italy together produced 60 per cent. of the average

world production of 760,000 tons of oil; Greece, Portugal, Tunisia and Turkey together produced 32 per cent., leaving only 8 per cent. for the combined contribution of all other countries, principally Algeria, French Morocco and Syria. In quality the bulk of the Italian oil is inferior to that of France (the Provence oil), but the oils of Lucca in Tuscany and of Liguria are unsurpassed.

In most countries, production both of olives and of olive oil is largely for home consumption. The chief importing countries outside Europe have been the United States and the South and Central American republics, especially Argentina, but increasing production of other edible oils in South America has affected this trade adversely. During the Second World War, the United Kingdom imports of olive oil almost disappeared, and the years 1946-51 saw only a partial recovery of the trade: an annual average of 2,600 tons as against the pre-war average of 10,000 tons.

Cottonseed oil has given economic value to a by-product of the cotton-growing industry which was for a long time, and to some extent still is, treated as a waste product. Cottonseed is costly to market, but waste has been reduced by increasing the number of crushing plants in the producing countries. The change is reflected in the United Kingdom trade returns. In 1938 the import of cottonseed for expressing the oil was over 620,000 tons and of cottonseed oil 5,700 tons. In 1950 the import of cottonseed was down to 150,000 tons, while the import of the oil was up to 10,300 tons. The potentialities may be gauged from the double fact that the world output of cottonseed is in the region of 12 or 13m. tons and that the yield of oil averages 18 per cent.—more than one-sixth. The oil is largely used as a substitute for olive-oil, from which it can scarcely be distinguished in flavour. In pre-war years Egypt shipped nearly half the world's exports of seed, but her trade disappeared in the war years and by 1950 Pakistan, the Anglo-Egyptian Sudan and Uganda were providing three-quarters of all the exports of seed, while the United States and Argentina were responsible for four-fifths of all the exports of oil. The refining of the oil has become a great industry at Hull. Besides the refined oil the seed yields much oil that is mixed with beef products to form compound lard, and the inferior kinds are used in the making of soap, candles, and gramophone records. The refuse cake or meal is used as both a cattle-food and a fertiliser, and the hulls in the form of bran can be used without any other feed to fatten the cattle.

Linseed, as already noted (p. 150), is another name for flax seed, and is the product for which the flax plant is mostly widely cultivated. World production in 1938 amounted to close on $3\frac{1}{2}$ m. tons, of which Argentina provided nearly $1\frac{1}{2}$ m. tons, the Soviet Union nearly $\frac{3}{4}$ m. tons, and India nearly $\frac{1}{2}$ m. tons. Fully half the total production entered international trade, the great bulk of the Argentine crop

being exported and about half the Indian crop. The United States headed the list of individual importing countries, but collectively the United Kingdom and other countries of Western Europe absorbed the greater part of the available supplies. The United Kingdom took the bulk of India's exports, its imports of 276,000 tons in 1938 including little else except 44,000 tons from Argentina.

During the war, world production of linseed, though subject to considerable fluctuations, was fairly well maintained, and in 1950, as in 1938, it was close on 3½m. tons. Very different was the record of world trade. With the loss of the Continental markets of Western Europe, exports of seed dwindled from 1½m. tons in 1938 to 116,000 tons in 1947 before making some recovery to nearly ½m. tons in 1950. Imports of seed into the United Kingdom fell correspondingly, reaching only 19,000 tons in 1948. After that year India ceased to be the main source of Britain's supply, and in 1951 the bulk of the 33,000 tons imported came from Argentina. Meanwhile, Argentina had built up a considerable though not yet equivalent trade in linseed oil. Before the war Argentina did not export any of this oil, which was expressed from the seed by the importing countries; in 1950 it exported 203,000 tons. The seed yields 33 per cent. of its weight in oil, so that Argentina's exports of linseed oil in 1950 accounted for 609,000 tons of seed. The United Kingdom import of linseed oil in 1950 was 111,000 tons, nearly six times the pre-war (1938) import of 19,000 tons. The pre-war supplies came from the Continent; the post-war, nearly all from Argentina.

The property of drying on exposure to the air, which gives linseed oil its special importance in making paints and varnishes, adapts it for many other uses. When treated with sulphur it forms linoleum, a soft substance which can be used for many of the purposes of rubber or gutta-percha. In composition with various fabrics, and in particular mixed with ground cork, it is largely used for floor coverings, to which the name linoleum has been transferred.

Groundnuts (see p. 138) contain an oil which is largely used for margarine. They constitute one of the biggest world crops of oil seeds, covering over 27m. acres and yielding about 10m. tons of unshelled nuts a year, chiefly in India (35 per cent.), China (30 per cent.), British and French West Africa (10 per cent.), and the United States (10 per cent.). The unshelled nuts yield, in commercial practice, about 30 per cent. of oil, and the shelled nuts about 40 per cent. The best oil is expressed from the unshelled nuts, but usually the nuts are shelled before export, to save freight, the shelled nuts being about 70 per cent. of the weight unshelled. Before the Second World War nearly one-third of the world output entered international trade. Exports averaged 1·7m. tons of shelled nuts or their equivalent, India supplying about half and West Africa most of the remainder. Europe took 90 per cent. of the exports, France having the biggest

share, followed by Germany and the United Kingdom, these three taking nearly 1½m. tons.

During the war, production kept remarkably steady, but exports dropped to about a third of the pre-war level before rising in 1948–50 to about a half. Groundnuts are not only used to express oil; they are good to eat for man and beast, and in the general shortage of foodstuffs they were used increasingly for that purpose. In 1946 India restricted the export of groundnuts, and since that year Nigeria has headed the list of exporting countries; it contributes annually some 300,000 tons of shelled nuts to world trade, and the Gambia, which is largely dependent on groundnuts commercially, may add anything up to 70,000 tons; French West Africa provides about 200,000 tons. Europe continues to take about 90 per cent. of the total exports, but the United Kingdom now takes the biggest share, followed by France. A scheme for large-scale production in Tanganyika was sponsored by the British Government after the war, but met with such difficulties that its scope had to be severely curtailed.

Soya-beans (pp. 137–38) have a low oil content—about 15 per cent. as expressed commercially. The oil has long been used for cooking in China, and with the discovery early in the present century of methods of ridding it of a rancid flavour it began to be used in the West in the manufacture of compound lard and margarine. A big trade soon developed, but the quantities coming on to the world market declined towards the end of the period between the two world wars—from an annual average of 200,000 tons of oil in the five years 1924–28 to 180,000 tons in 1929–33 and 125,000 tons in 1934–38. Manchuria contributed about 60 per cent. of the total, and when that country was shut off by the Second World War, Europe received very little. A compensating factor has been a big development of the United States crop of soya-beans, attended by a corresponding development in that country's exports of soya-bean oil—from under 3,000 tons in 1938 to 134,000 tons in 1950, the chief beneficiaries being Germany, Spain and Italy.

Two palm trees yield large supplies of oil—the **coconut palm** and the **oil palm**. The coconut palm flourishes in the coastal belts of tropical countries, especially around the shores of the Indian Ocean and in the Western Pacific. Before the Second World War, **coconut oil** constituted one-fourth of the vegetable oils and one-fifth of all oils and fats entering international trade. It is expressed from copra, the dried flesh of the coconut, the yield being as much as 63 per cent. of oil suitable for soap and margarine. The pre-war production of copra was between 3m. and 4m. tons a year, of which about half was exported. Copra itself entered into world trade to the amount of 1½m. tons (oil potential 850,000 tons), and exports of oil as distinct from copra amounted to 340,000 tons (equivalent to ½m. tons of copra). Until the 1939–45 war upset world economy, the Dutch East

Indies, the Philippines and Malaya supplied about three-fourths of the copra exported; exports of oil came chiefly from the Philippines, Ceylon and Malaya. The trade in both copra and oil was widely distributed, the biggest share going to the United States. During the war, with so many of the chief sources of supply in Japanese occupation, world trade dwindled to small proportions, but by 1951 it had been restored to its pre-war level, a decrease in the exports from Malaya and Indonesia being balanced by a notable increase in the exports from the Philippines.

The **oil palm**, or Guinea oil palm (*Eloeis guineensis*, Jacq.), is indigenous to West Africa between 10° N. and 10° S. Since the First World War it has also been widely cultivated in the Dutch East Indies (Indonesia) and Malaya. Its fruit yields two distinct oils—**palm oil**, which is expressed from the pericarp or fibrous matter surrounding the kernel, and **palm kernel oil**, which is crushed from the hard kernel. The pericarp yields a very varied percentage of oil, which is usually expressed locally and exported for use chiefly in soap-making and the tinsplate industry, though also used to some extent for edible fats. Palm kernels yield about 50 per cent. of oil and are usually exported whole, the oil being extracted in the importing country; it resembles coconut oil and is used for making margarine and soap.

Before the Second World War the exports of palm oil rose to $\frac{1}{2}$ m. tons, of which South-east Asia supplied half and West Africa the other half, with the Dutch East Indies and Nigeria as the two outstanding sources of supply, and the United Kingdom and United States as the chief importing countries. Exports of palm kernels totalled over $\frac{3}{4}$ m. tons, of which the Dutch East Indies and Malaya supplied only a small part, the great bulk coming from West Africa, with Nigeria as the dominant contributor (nearly half) and Europe (particularly Germany) as the supreme market. Apart from South-east Asia, the supplies were fairly well maintained during the war. By 1950 the total exports of palm oil were up to the pre-war level, but Indonesia's contribution was still less than half its former quantity while that of Nigeria had risen by more than half; the Belgian Congo had moreover stepped up its exports to become the second source of supply. A change was apparent, too, in the distribution of imports, the United States receiving only 5 per cent. of the available supply as against 47 per cent. reaching the United Kingdom. In the case of palm kernels, exports in 1950 were somewhat higher than before the war owing to an increased production in Nigeria, and the list of importing countries was headed by the United Kingdom (57 per cent.) and Western Germany (13 per cent.).

Rapeseed, which comprises various species of the Brassicas (Cabbage) family, including the summer variety known as colza, is one of the most widely grown oilseeds, especially in Eastern Asia.

It yields 35 per cent. of a lubricating oil, which is also widely used for edible purposes, and during the war it more than held its own among world crops, the cultivated area increasing from 16-17m. acres to 20m. acres, and production from 4m. to 5m. tons—most of it grown in China (over 60 per cent.), India (25 per cent.) and Japan. Yet commercially it takes a minor place among oilseeds, less than 5 per cent. of the production entering into world trade whether as seed or oil. Pre-war exports of seed amounted to about 100,000 tons, and of oil to 25,000 tons (equivalent to about 75,000 tons of seed). During the war the trade in seed tended to decline. By 1947, following the cessation of exports from India, it had fallen as low as 7,000 tons, but recovered to 52,000 tons in 1950, Sweden emerging as the one outstanding source of supply. Exports of oil also reached a low level (5,300 tons) in 1947, the recovery to 20,000 tons in 1950 being again due to Swedish production.

The **sesame seed** of commerce includes till, gingelly, and benniseed, all of which yield a high percentage (nearly half) of an edible oil favoured for confectionery. Like rapeseed, it is widely grown for home consumption, chiefly in Eastern Asia, but does not enter largely into international trade. China and India had far and away the biggest share of the pre-war production of $1\frac{1}{2}$ - $1\frac{3}{4}$ m. tons. There was a moderate decline in the total during the war, and the comparatively small trade was reduced to meagre proportions, but by 1950 a substantial recovery had taken place. The Sudan and Mexico have provided developments of some note. Both have increased their acreage considerably, and their crops in 1950, amounting to $\frac{1}{4}$ m. tons (Sudan 168,000 tons, Mexico 90,000 tons) were the largest after China and India.

Sunflower seed. The Soviet Union is the dominant factor in the production of this seed, but does not normally contribute to international trade in it or in sunflower seed oil. Before the war the Soviet Union had about 8m. acres under crop out of a world total of under 10m. acres, and produced 2m. tons of seed out of a world total of about $2\frac{1}{2}$ m. tons. In 1950 the Soviet acreage and production had increased by about a fifth, but the world totals had increased by two-thirds and three-quarters respectively. Crops had gone ahead in Hungary and south-eastern Europe, but the outstanding development was in Argentina; there both acreage and production increased strikingly, extending to over 4m. acres yielding up to 1m. tons of seed, and a considerable export trade developed in oil expressed from the seed—more than 100,000 tons in 1950. The United Kingdom, whose pre-war imports of the oil were nil, took 72,000 tons in 1950, nearly all from Argentina. Trade in the seed, as distinct from the oil, is everywhere small. Like groundnuts, sunflower seed is used locally for food. It yields about 25 per cent. of oil, the best grades being suitable for foodstuffs, others for soap, paint and lubricating.

Tung oil, or Chinese wood oil, has a reputation for unique drying properties, which give it value in the manufacture of paints and varnishes, linoleum and oilcloth, and have led to its cultivation outside China. The oil is expressed from the fruits of the tung tree, which have a commercial yield of about 16 per cent. Chinese production of the oil is estimated at about 100,000 tons a year and exports at 60,000 tons compared with a seasonal production of 120,000 tons before the Second World War and average exports of nearly 80,000 tons. Normally the chief customer is the United States, which itself has over 14m. trees. It is estimated that Argentina has 12m. trees, while other interested countries include Brazil, the Soviet Union, Nyasaland and Malaya. In 1951 the United Kingdom imported 12,600 tons, chiefly from China, through Hong Kong.

Another vegetable oil with drying properties, useful for varnishes, &c., is derived from **perilla seed**, the commercial rate of extraction being about 37 per cent. Perilla, a plant which is akin to peppermint and spearmint, is mostly grown in Eastern Asia, especially Manchuria, where cultivation spread rapidly before the Second World War and covered some 400,000 acres, yielding nearly three-fourths of the average world production of 170,000 tons. The Manchurian crop was grown largely for export, and in the years immediately before the war it provided for overseas markets an average of 64,000 tons of seed and 14,000 tons of oil. The seed went to Japan and thence, as oil, to the United States. Production since the war seems to have declined, and by 1952 there were no signs of the revival of trade in its wider aspects.

Babassu kernels, derived from a palm tree growing wild in Brazil, are as rich in oil as copra (63 per cent.) and the oil is not unlike coconut oil. They are extremely hard, and the difficulty of cracking them has hindered their utilisation. But during and after the Second World War an annual output of about 70,000 tons was maintained, and the full potential production is estimated to be over 30m. tons. Already before the war the United States had displaced Europe as the chief market.

Poppy-seed is a by-product of the white or opium poppy of Asia and a major product of the black poppy, which is grown in Europe for edible and industrial use. It yields over 40 per cent. of oil. Europe's annual production of the seed before the Second World War was about 50,000 tons. Only small quantities enter into international trade. They are mainly European in origin and are imported by the United States and Germany.

Oil-cake is a general name for the masses of crushed seeds that remain after the oil has been pressed out of them, and it is now very largely used in the feeding of cattle, which it fattens very rapidly; frequently also as a manure. It is chiefly derived from linseed,

rapeseed and cottonseed, but also from coconut, in which form it is known as **poonac**.

Essential Oils. Essential oils are volatile, aromatic substances, usually but not always liquid, obtained from various grasses, plants, trees and shrubs. They are mainly used in perfumery, particularly the manufacture of soap, medicine, dental preparations, disinfectants, and for flavouring confectionery. The most important of these oils, forming a class by themselves, are the turpentine oils. World production before the Second World War amounted to 150,000 tons a year as compared with 10,000 tons of all other essential oils. **Spirit of turpentine** is obtained by distillation from the resin of various firs, pines and other cone-bearing trees. It is very largely used to dissolve resins, and in the making of paints and varnishes, as well as for cleaning. Until the end of the Second World War British imports were nearly all from the United States; thereafter they declined greatly because of the British shortage of dollars and Portugal became the chief supplier. In 1938 over 20,000 tons of turpentine were imported into the United Kingdom; in 1952 only 2,445 tons.

Among other essential oils are the citrus oils (from the peel of sweet and bitter oranges, lemons, grapefruit and limes); many varieties of flower oils such as attar of roses, jasmin oil and geranium oil; peppermint oil, citronella, cinnamon leaf and cinnamon bark oils; and camphor. There are many others, making up a valuable total; imports into the United Kingdom alone were valued at over £7m. in 1951, though all told they amounted to under 3,000 tons. It has already been noted that world production, apart from turpentine, is of no great quantity. Even the essential oils in largest supply—sweet orange and lemon oils, citronella and peppermint—have an estimated output of only from 600 to 800 tons.

The United States is the chief source of supply of **grapefruit** and **sweet orange oils**, **peppermint** and **spearmint** (the latter now largely used in canning peas); and it shares with Sicily the main production of **lemon oil**. The post-war dollar problem has led to a movement to increase production in the British Colonies, particularly East Africa, the West Indies, and Mauritius and Seychelles. **Lime oil** is already produced almost wholly in the Colonies (West Indies and West Africa), and Ceylon is the source of **cinnamon bark oil** and **cinnamon leaf oil**, both of which, especially the latter, are also produced in the Seychelles. **Clove oil** comes from the islands of Zanzibar and Pemba, and Kenya is producing appreciable quantities of **geranium oil** and **cedarwood oil**. Southern India, France and the French Colonies, and Indonesia also figure prominently in the supply of various essential oils. **Camphor** is mainly derived from a species of cinnamon (*Cinnamomum camphora*) which grows in Japan, Formosa (where it is a government monopoly), central China and the Malay Peninsula; it is extracted by distillation from the wood and leaves.

Small quantities of certain essential oils are produced in the United Kingdom, particularly **lavender**. English lavender is the finest in the world and is used in the making of the highest quality perfumes.

Waxes. The waxes of commerce are of animal, vegetable and mineral origin. Under the last head comes **paraffin wax** (p. 265). Waxes of animal and vegetable origin are not a very big factor in British trade. Imports of them into the United Kingdom in 1938 were only 5,000 tons (valued at about £½m.), and in 1951 they were very little higher (though valued at over £3m.). But they are of wide interest. **Beeswax**, with which **honey** may conveniently be considered, is an almost universal product. In Italy its use in connection with Catholic ceremonies has led to a considerable import, and in Europe generally the production of both honey and wax is less than the consumption. The deficiency is made good in part by the bees of the New World—another case of reciprocal benefits, for the honey bee was introduced into the New World by the Spaniards. Before the upset of war and currency difficulties, Canada and the West Indies, the United States and Central America supplied much of the honey imported into the United Kingdom, while Australia and New Zealand were also leading contributors; by 1950 Australia was supplying more than three-quarters of the total, with the West Indies, Argentine and Chile well behind. On the other hand the beeswax imported into the United Kingdom came, and continues to come, mostly from Equatorial Africa, principally British East Africa.

The chief vegetable waxes entering into world trade are **carnauba** and **candelilla**. Carnauba wax is found mainly in the form of a glutinous powder on the leaves of the carnauba or wax palm (*Copernicia cerifera*, Mart.); it is an important export from Brazil, the only country which supplies it in commercial quantities. Carnauba wax is in great demand and the price is high, but attempts to produce it synthetically have had little success. Other attempts to introduce it into the British tropical dependencies are still in the experimental stage. It is mostly used in making polishes, floor waxes and carbon paper. The high price of carnauba wax has increased the consumption of candelilla, which is found as a coating on a weed (*Pedilanthus pavonis*) growing mostly in Mexico but also in southern Texas. It is used for dressing leather, for furniture and shoe polishes, and as a substitute for beeswax and carnauba.

Less important, commercially, are **Japanese wax**, obtained from the berries of certain sumac trees (chiefly *Rhus succedanea*, Linn.) grown in Japan and China; and **myrtle wax**, which comes from a North American shrub (*Myrica cerifera*, Linn.) and is used in the manufacture of varnishes and gramophone records. The wax obtained from the **wax-palm of the Andes**, and the **insect white wax** of China, are both important in internal trade, but are not exported.

Gums and Resins. Resin is a general name for a variety of substances which are all originally fluids in the tissues of plants but become solid, are all more or less clear or translucent though generally with a tinge of colour, are all inflammable and insoluble in water, but generally are soluble in organic solvents and the essential oils such as turpentine. As a rule they exude in a fluid state from the trunks and branches of trees, but sometimes they are found in cavities inside the trees or in the ground where the trees have grown. **Gums** resemble resins in appearance and origin, but are soluble or swell in water, and are insoluble in alcohol and essential oils.

There is a valuable trade in these gums and resins. Imports into the United Kingdom alone in 1938 amounted to nearly 100,000 tons, valued at close on £2m., and in 1950 to nearly 115,000 tons valued at over £10m. The largest and most valuable of the imports in each of these years was **rosin** (colophony); in quantity it accounted for well over half the total, and a third or more of the value. It is used in the making of paper, soap, varnishes and printing inks, and for many other familiar purposes. Rosin is obtained by distilling turpentine, and is the substance left after the oil of turpentine has been separated. Both are produced mainly in the United States, and that country supplies nearly half the United Kingdom imports of rosin. Substantial amounts are also produced in France and Portugal, and the latter country challenges and sometimes surpasses the United States as a source of United Kingdom imports.

The other resins of commerce are mainly used in the making of varnishes and lacquers and for burning of incense. Next to rosin in quantity among the imports into the United Kingdom is **copal** (*Copaifera copallifera*), frequently known as gum copal. It is obtained from both the Old World and the New, but the Belgian Congo dominates the market, with medium grade supplies. East Africa produces a small quantity of high quality copal. United Kingdom imports of all types of copal in 1951 amounted to nearly 11,000 tons—slightly more than the pre-war average. But the post-war average value of over £7 a cwt. is nearly six times the pre-war value.

One of the most valuable resins imported into the United Kingdom is **lac**. The quantity in 1951, 9,300 tons, was about half as much again as in 1938, but its import value was elevenfold, exceeding £3m. Lac is entered in the Trade Returns under three names—sticklac, seedlac, and shellac. The resin is secreted by the lac insect (*Tachardia lacca*), parasitic on a number of host-trees, among which *Sechleicheria trijuga*, *Butea frondosa* and *Zizyphus jujuba* are the most important. The main source of supply is India (chiefly in Bihar and Orissa and the former Central Provinces, now Madhya Pradesh), with much smaller production in Siam and Indo-China. The twigs of the tree encrusted with the resin form **sticklac**; when the resin is separated from the wood and washed free from lac dye, &c., it appears in the

form of grains known as **seedlac**; and when it is melted and strained and made into thin irregular sheets it is called **shellac**. Lac in its various forms is used in making varnishes, lacquers, sealing wax and in the electrical industry, as well as in the manufacture of gramophone records—now its most important use.

Gum arabic is largely imported into the United Kingdom for use in the confectionery trade (which absorbs 60 per cent. of the total), in pharmacy, as an adhesive for postage stamps, and in high-class stationery. Poorer grades are used in the lustreing of silk, crêpe, &c., as 'dressings' for fabrics, in calico printing, and in making matches. Among numerous other uses, it enters into the making of fine colours and lithographic ink. Imports in 1951 amounted to 13,000 tons (more than twice as much as in 1938) valued at nearly £1·4m. (over six times as much as in 1938). Gum arabic is derived from various species of *Acacia* growing in different parts of the world. The best kind is imported into Europe, mostly from northern Africa and in particular from the old Anglo-Egyptian Sudan. It is derived mainly from *Acacia senegal* (or *Acacia vereke*, Ait.), a tree found throughout the Sudan, using that term in its geographical sense as applied to the whole region south of the Sahara, between the Senegal and the Nile. An allied species is found in the arid portion of India immediately to the north-west of the Deccan Peninsula. The trade in gum from the Senegal region is in French hands, and that particular gum is imported into other countries mainly from France. Other important species of the gum are *Acacia seyal*, also found mainly in the Sudan in its narrow sense, and *Acacia drepanolobium*, which is found in the Sudan but is more important in Tanganyika, where it forms about 95 per cent. of the production. Nigeria also produces gum arabic on a commercial scale.

Gum tragacanth is more expensive and is imported into this country in smaller quantities than gum arabic—in 1951 just over 1,000 tons valued at over £1m. It is used in calico printing as a vehicle for applying discharges (chemical agents for removing colour), and for pharmaceutical and other purposes. There is no Empire source of this gum. It is the product of several species of *Astragalus*, belonging to the countries around and beyond the Mediterranean; Iran is the main source of the United Kingdom imports.

Two other gums are Karaya, which comes mainly from India and is a product of a number of *Sterculia* species; and Kauri gum, the resin of the New Zealand pine, which is a species of *Dammara* (*D. australis*, Lamb). **Karaya gum** did not figure in the returns in 1938; in 1950, 440 tons were imported. It is growing in favour in industry, particularly in the United States where it is used in the manufacture of sauces and ice-cream. **Kauri gum**, the finest of all resins for varnishes, is now scarce. Not only have the New Zealand pine forests been much reduced, but the gum from the living tree is of minor

value. The best Kauri gum is a fossil product dug in lumps from the site of ancient forests, now forming the Fern Country of the North Island; and this ground has been pretty well worked over. Imports into the United Kingdom declined from 2,000 tons in 1934 to 650 tons in 1950.

Other gums and resins entering into commerce include **dammar**, the product of a cone-bearing tree (*Dammara orientalis*, Lamb.) which grows in the Malay Archipelago; **sandarach**, the product of another cone-bearing tree found in North and South Africa, Australia and North America; **mastix**, the product of a species of *Pistacia* found above all on the island of Chios; and **amber**, the product of an extinct conifer, found mainly on the Baltic coast of Prussia and used largely for ornamental purposes, especially in China. Of the resins burnt as incense, the most important are **true frankincense**, the product of various species of tree belonging to the genus *Boswellia*; **myrrh**, the product of a species of *Balsamodendron*; and **bensoin**, derived from the bark of *Styrax bensoin*. This last is also used medicinally.

SPICES, STIMULANTS AND CONDIMENTS. The most important spices are all products of the torrid zone—principally pepper, ginger, cloves and mace. Imports of all four and of other spices into the United Kingdom in 1938 were about 8,000 tons valued at £340,000, and in 1950 about 10,500 tons valued at £4m.

Peppercorns and black and white pepper, which make up the great bulk of the pepper of commerce, are all derived from one species, a twining and climbing plant, *Piper nigrum*, Linn., largely cultivated in southern India, the Malay Archipelago, and Indo-China. Its spice is the most generally used of all spices, among both rich and poor. The peppercorns are the whole berries, and black and white pepper the result of grinding them; for white pepper the peppercorns are first deprived of their outer skin by steeping them in water for several days. Nearly the whole of the pepper imported into this country comes from the Malay Peninsula, but more than half of this import is the product of Java, Siam, and Indo-China, collected at Singapore. Another species (*P. longum*, Linn.) produces **long pepper**, which is the dried unripe fruit of that shrub; **cubebs** are the berries of another species (*P. Cubeba*, Linn.); and a fourth species, the **Betel** (*P. Betel*, Linn.), furnishes the leaves which are used along with areca-nut and other ingredients to compose the favourite stimulant chewing-mixture of the people of India. **Cayenne pepper** is the product of a totally different plant, being the ground pods of different species of *Capsicum*, one of which has smaller pods, used entire in pickling, under the name of **chillies**. Originally natives of South America, they are now grown in tropical countries in the Old World as well as the New, and even in the warmer parts of the temperate zone, as in Spain and Hungary. Before the Second World

War the United Kingdom was the great market for all kinds of peppers, and re-exported usually from one-third to two-thirds of her imports, but during the war, when the Japanese occupation of the principal countries of supply led to a world pepper famine, this re-export trade disappeared, and up to the end of 1952 had not revived.

Ginger is the dried root-stock of a plant (*Zingiber officinale*, Rosc.) native to south-eastern Asia, but now largely cultivated also in the West Indies and in British West Africa. Almost all the British imports are from the British West Indies, Sierra Leone and Nigeria. The West Indian article has the higher average value. Before the war there was an even larger import of ginger preserved in syrup as a confection, and this came mostly from Hong Kong and China.

Cloves are the flower buds of *Eugenia caryophyllata*, Linn., dried before opening. Zanzibar's two islands, Zanzibar and Pemba, particularly the latter, provide the bulk of the world supply. They have over 4m. clove trees, which have yielded, on an average, nearly 10,000 tons a year. Local industry includes the distillation of clove oils, and the clove tree has been the main factor in the economy of Zanzibar. A serious outbreak of the 'Sudden Death' disease since the Second World War has affected the outlook. Minor sources of supply, hitherto, have been Madagascar and the Moluccas—the latter the original home of the clove tree.

Mace is closely associated with **nutmegs**. Both come from the same tree, *Myristica fragrans*, Willd.; nutmegs are the kernel of the fruit and mace the investment of that kernel. This tree also came originally from the Moluccas, but has been introduced into the West Indies. It is noteworthy that Indonesia produces the better nutmegs, and the West Indies the better mace.

Among other spices, the cinnamon of the shops comes from two different trees, consisting in both cases of the bark (ground or unground) of the smaller twigs. The dearer and better product is derived from the *Cinnamomum zeylanicum*, Nees., or Ceylon cinnamon, and is distinguished in commerce as **true cinnamon**, though it was not discovered till the thirteenth century, and probably the cinnamon of the ancients was the **cassia lignea** of commerce, the product of *Cinnamomum loureirii*, Linn. The Ceylon cinnamon is very exacting as to soil and climate, and much of it has been replaced by coconuts. The tree is also grown in the Malay Archipelago, and has been introduced into the West Indies and South America. The cassia lignea is much more widespread, growing wild (as well as cultivated) in the tropical and sub-tropical parts of both the Old and the New World; but the commercial supplies come mostly from China.

Kola nuts, which contain caffeine, and are largely used as a stimulant in tropical Africa, are derived from various species of the

Cola tree, particularly *Cola acuminata*, Schott and End. This tree has also been introduced into the New World. The *coca* shrub (*Erythroxylum coca*, Lam., and other species) is native to tropical South America on the eastern side of the Andes. Ever since the discovery of those regions its leaves have been known to impart, when chewed, an extraordinary power of enduring fatigue; they now enter into commerce as the source of the alkaloid cocaine.

Most of the other spices come from the British West Indies, the most important being **pimento**, or **all-spice**, the unripe dried berries of the *Pimenta officinalis*, Lindl., which is cultivated chiefly in Jamaica. Among the minor spices in European trade may be mentioned **cardamoms** (*Elettaria cardamomum*), the most valuable of all Indian condiments; they are grown to such an extent on the mountains of southern India that the range forming the background of the state of Travancore has been named Cardamom Hills. **Vanilla** (*Vanilla planifolia*) is the pod of a twining orchid originally belonging to Mexico and South America, but long since introduced into the tropics of the Old World, notably the islands of Reunion, Mauritius, Rodriguez, Seychelles, and Ceylon, which now rival Mexico in the production of this commodity. **Cummin**, the seed of a plant (*Cuminum syminum*) native to the upper Nile regions, but introduced at an early stage into southern and eastern Asia, now plays little, if any, part in European commerce. **Star-anise**, the seeds of a tree (*Illicium verum*, Hook. f.) belonging to southern China, is imported into Europe as a flavouring for spirits. The chief spices and condiments grown in Europe are **fennel**, **caraways**, **coriander**, **aniseed**, and **mustard**.

DYE-STUFFS FROM THE VEGETABLE KINGDOM.

Vegetable dyes have been largely replaced in modern industry and trade by dyes made from coal-tar products. Dye-woods are the heart-wood of certain trees, chiefly grown in tropical countries. **Logwood**, a wood of a dark-red colour yielding an extract which is used in dyeing blue, brown, and black, comes from *Hæmatoxylon campechianum*, Linn., a lofty tree very abundant in the district of of Campeachy, in the Mexican province of Yucatan, but mainly exported from the West Indies and British Honduras. The other principal dye-wood is **fustic**, a wood yielding a yellow colouring-matter, used in combination with other materials to produce dyes of different colours. It is the product of *Morus tinctoria*, Don., and is exported mainly from Nicaragua under the name of **mora-wood**.

Other dye-stuffs of vegetable origin are either parts of herbs from which dyes may be extracted, or extracts used in dyeing, whether derived from herbs or from the wood of trees. The fine blue dye, **indigo**, is obtained chiefly from a shrub *Indigofera tinctoria*, Linn., a native of the tropical parts of south-eastern Asia, and of South America and Egypt. Commercially its place has been largely taken

by the synthetic **indigotin**. Of former rather than present importance also are madder and safflower. Madder is variously known as **madder**, **madder-root**, **garancine**, and **munjeet**; garancine being the colouring principle extracted from the madder-plant, and munjeet being the Indian madder (*Rubia cordifolia*, Linn.). The European madder, *Rubia tinctorum*, Linn., used to be the principal source of certain red and yellow dyes. Other red and yellow dyes were obtained from the flower-heads of the **safflower** (*Carthamus tinctorius*, Linn.).

Cochineal, a red colouring-matter, is obtained from the dried bodies of an insect (*Dactylopius coccus*, Costa), allied to the insect which yields the lac of India (p. 231) and to the kermes insect, which lives on the kermes oak in the Mediterranean region and yields another red dye, the 'scarlet' of the Bible. Cochineal is still imported from the Canary Islands, where the various species of the Napolea plant upon which the insect feeds are largely grown for the sake of this product. Also imported from the Canary Islands, as well as from tropical Africa and tropical America, is a lichen (*Roccella tinctoria*, DC.) from which two dyes are obtained. One of these, a blue dye, is **litmus**, the colouring for the well-known litmus paper used as a test for acids, which change the colour from blue to red. Another dye used for chemical tests is **turmeric**, an extract from the underground stem of *Curcuma tinctoria*, Roxb., an oriental plant. **Gamboge**, the hardened sap of another tree belonging to south-east Asia, is, like turmeric, a yellow dye; both are used in making coloured varnishes.

TIMBER. The timbers of commerce are usually classified as 'softwoods' (derived from coniferous trees—Gymnosperms), and 'hardwoods' (derived from deciduous and evergreen broad-leaved trees—Angiosperms). For the most part the two classes consist of relatively 'soft' and 'hard' timbers, but the distinction is botanical and there are notable exceptions to the applicability of the two terms, some of the softest and lightest known timbers being technically 'hardwoods'.

Timber is, for the most part, exported on a large scale only where there are exceptional facilities for water transport. Most of the timbers of commerce are '**softwoods**' obtained mainly from **firs** and **pin**es. They are in general use for building purposes; also enormous quantities of pulpwood are consumed, especially in Canada, in the manufacture of woodpulp for newsprint. Canada, Brazil and Russia are the only countries now having a large reserve of 'natural' softwood, but many countries of Europe have a steady output from plantations. Two-thirds of the world's production of timber comes from the northern forests, mainly softwoods, which stretch across Europe, the U.S.S.R., and North America; one-third is from the tropical forests, mainly hardwoods, which stretch across Africa,

South-east Asia, and Central and South America. The proportion of softwood timber which finds its way into international trade is still greater—something like 90 per cent.; and the balance of commercial timbers is made up mostly of temperate hardwoods. Although there are vast reserves of tropical hardwoods, they provide at present only a small percentage of the world's trade in timbers. They include beautiful cabinet woods, but the trees in tropical forests are very mixed, and it is difficult to extract one particular type.

Trade in Softwoods. The chief softwood exporting countries are Finland, Sweden, Canada and the United States; though this last not only exports but imports largely, especially from Canada, and on balance is a net importer. Formerly Russia, Latvia and Poland were big exporters, but now their exports are much reduced and this is one of the factors in the post-war shortage of softwoods. The United Kingdom has suffered also from its shortage of dollars, limiting the purchases of timber from Canada and the United States.

No total figure for the quantity of timber imported into the United Kingdom can readily be given. The trade returns quote wood and timber imports in several measures of quantity: standards, piled cubic fathoms, cubic feet, tons, and cwt. No attempt is made to estimate the quantity in a common denominator, and the figures here put forward in an endeavour to sum up the position do not claim to be impeccable. Softwoods are mostly calculated in standards, and are listed as hewn, or sawn, or planed, or boxboards, as the case may be; the great bulk arrive sawn. Sleepers of all kinds are also recorded in standards, but roundwood logs of pine, spruce, &c., are reckoned in piled cubic fathoms, as also are pitprops. Hardwoods are measured in cubic feet. There are various measures for a standard of timber; one of the commonest, the Petrograd standard, is equivalent to 165 cubic feet. It is not the largest, and its adoption for conversion purposes in connection with United Kingdom imports will not give an exaggerated idea of the quantity. A piled cubic fathom is 216 cubic feet. If these rates be applied for purposes of conversion on a rough and ready basis, with due recognition of the possibilities of error, the sum total of the imports of timber into the United Kingdom in 1938 is found to have been about 550m. cubic feet, while in 1951, though the imports were considerably more than in some of the intervening years, the total was still only about 450m. cubic feet, due largely to the general shortage of softwoods, which accounted for about nine-tenths of the whole.

If figures for the total imports by quantity are difficult of precise assessment, but in general confirm the impression of a post-war shortage of softwoods, there is no doubt about the increase in value. In 1938 the value of all imports of wood and timber was returned as under £43m.; in 1951 the smaller quantity imported was valued at over £220m., or more than five times the pre-war figure.

Hardwoods. Analysis of the hardwood imports is particularly instructive as showing the effect of the dollar shortage in changing the avenues of trade. Before the Second World War, the United Kingdom imports of hardwoods averaged (1934-38) nearly 46m. cubic feet a year, of which the United States and Canada supplied 55 per cent., British Colonies 6 per cent., and the rest of the world 39 per cent. By 1951 these imports, which had fallen much lower in the interval, had risen to over 60m. cubic feet, but the proportion supplied by Canada and the United States was only 7 or 8 per cent., while the Colonies (principally West Africa) had jumped up to over 40 per cent., and about half the total was supplied by other countries.

Among the temperate hardwoods, **oak** is normally a large export both from North America and from central Europe. Elm, beech, walnut, and maple are among the other important timber-trees of the temperate zone, and the spotted wood of the New England sugar-maple, known as bird's-eye maple, is highly esteemed for cabinet work. Prominent among tropical hardwoods is **mahogany**, the wood of *Swietenia mahogoni*, L., a large tree belonging to tropical America, including the West Indies. The best quality is obtained from Cuba. When grown on marshy ground, like most of that of British Honduras, the timber is comparatively soft. Under the name of mahogany various red cabinet woods are now largely imported from West Africa. **Teak** is of the highest value for shipbuilding and in construction generally, being as hard and durable as oak, and having at the same time this advantage over oak, that while the latter timber is said to promote rust, teak contains an oil which tends to preserve iron by preventing rust. It is chiefly imported from Burma and Siam, but is largely grown in other parts of the East Indies. It is obtained from regions of moderate rainfall, between 40 and 80 inches. As the wood when full of sap is heavier than water, the tree has to be killed by cutting off a ring of the bark, to allow of it being floated down stream. **Ebony** is a name given to the wood of various trees. The hardest, blackest, and most valuable kind is the product of *Diospyros Ebenum*, Koe., a native of India. **Rose-wood** is another name given to several different kinds of timber, the best being derived from various species of *Casalpinia*; the best of all, it is said, from *Casalpinia brasiliensis*, Sw. The term **cedar** is used with equal laxity, being applied to a number of trees whose wood is thought to resemble that of the true cedar of Lebanon in colour or appearance or both. The cedar of Lebanon furnishes none of the timber of commerce. The **white cedar** is derived from *Juniperus oxycedrus*, L., *Cupressus thyoides*, L., and other trees; the **red cedar** (used in making pencils) from *Juniperus virginiana*, L., and *J. bermudiana*, L. Most of the cedarwood of commerce comes from the West Indies and Central America. Red woods derived

from two gigantic species of *Eucalyptus*—**jarrah**, or *Eucalyptus marginata*, and **karri**, or *E. diversicolor*—are imported from Western Australia for the manufacture of paving blocks, furniture, and other purposes. The wood of the jarrah is also very useful in making piles to be sunk in water, as it has remarkable durability in water both salt and fresh. They both grow in restricted areas in the south-west of the state.

FURS. The fur trade deals in the skins of a great variety of animals differing greatly in size and value. Its products are collected in a few big markets where merchants and manufacturers can supply themselves with the kinds best suited to their requirements. The regions from which the furs are collected are almost exclusively the temperate and cold parts of the world, the finest sorts being all from the colder regions. Most of the furs come, therefore, from the northern hemisphere, where there is the greatest area of land in high latitudes. The furs from North America and the adjacent seas are collected, to a large extent, at the **New York** market, but in still greater quantity reach the **London** market, which also receives large supplies from the southern hemisphere as well as from Europe. The furs of Siberia and northern Russia are principally collected at **Gorky**. Another major market is that of **Leipzig**, which owes its importance to its central situation, not only as regards the source of supply, but as regards the region in which furs are mostly worn, fur garments being more in demand in central and eastern Europe than in western Europe, where the winters are relatively mild. They are also largely worn by the well-to-do classes in China.

To enumerate all the animals that contribute a share to the fur trade would be to mention nearly all the land mammals belonging to the colder parts of the earth, as well as a good many of those belonging to more temperate regions, and several marine mammals. Among those which supply the greatest number of skins to the trade are **squirrels**, **hares**, **rabbits**, **musk-rats** (a kind of beaver belonging to North America), **coypus** (a beaver-like animal whose skins are imported, under the name of nutria skins, mainly from the region round the River Plate in South America), **cats**, and **seals**. Before the Second World War, rabbit skins were imported into the United Kingdom alone in numbers up to 26m. in one year, undressed (mostly from Australia and New Zealand), and 10m. dressed (mostly from Belgium). Among the mammals which yield the furs of greatest value are the **sable** (from Russia and Siberia, and from North America), the **stoat** or **ermine** (from Europe and Asia), the **sea-otter** (from the west coast of North America), the **black** or **silver fox**, and the true **fur seal**. The coat of the blubber-seal is of but little value, and the true **fur seal**, which yields the valuable sealskin of commerce, is a species belonging to a group distinguished from other seals by the possession of external ears. This species is obtained

chiefly on the Pribilof Islands, two small islands in Bering Sea, where they come annually to breed. Under the regulations of the Government of the United States only limited numbers may be killed there every year. The species is also hunted by Canadian sealers in Bering Sea and the North Pacific.

The fur trade of British North America was for a long time the monopoly of the Hudson's Bay Company, founded in 1670. Two hundred years later the company sold its rights to the Dominion of Canada, though still retaining certain stations and a portion of the land. Now there are several other fur-companies operating in the same region. The Russian fur trade has been from the first to some extent in the hands of the Russian government. An important development in the fur trade in the present century has been the breeding of certain fur-bearing animals, notably the silver fox, on farms, especially in Canada.

MEAT. Not very long ago considerable quantities of the meat supply of the United Kingdom were obtained from the larger domestic animals imported alive; and Eire still supplies annually in normal years more than 400,000 cattle and 50-100,000 sheep and lambs, of the total value of about £20m. By far the largest supplies of imported fresh meat are now, however, obtained by the process of refrigeration. This process was first tried, with more or less success, about 1875 in America in the chilling of beef, a process by which the meat is cooled only to a temperature of 29° to 30° F., and is not hardened. Both beef and mutton are also carried in large quantities frozen at temperatures of from 10° to 15° F., in which case they have to be thawed out before being ready for consumption. The principal market for these products has always been the United Kingdom. If it had not been for these supplies it is probable that the cost of living would have been greatly enhanced in this country, and a more or less serious check given to the development of our manufactures.

The chief sources of frozen meat are Australia, New Zealand, and the Argentine Republic. Chilled beef comes mainly from the Argentine. Chilling preserves the quality better than freezing, but the geographical factor comes into play; from the greater distance of Australia and New Zealand, meat carries best when frozen. The trade in frozen mutton began in earnest in 1881. In that year the import first exceeded 10,000 carcasses (all from Australia). Before the First World War the mutton and lamb carcasses imported (1913) had increased in number to some 13m., and the total import of chilled or frozen beef and mutton was over 14m. cwt. Before the Second World War the total had further increased to over 19m. cwt., with an import value of some £43 m. Beef provided nearly two-thirds of the whole in quantity, but little more than half the value. Including meat imported in other forms, it was estimated that the

imported supplies constituted 40 per cent. of the total consumption of meat in the United Kingdom.

The Second World War was responsible for many changes in the production and distribution of meat supplies, and post-war currency difficulties, involving continued government controls, prevented any early return to normal trade conditions. In 1952, imports of chilled and frozen beef and mutton were still only 10m. cwt.—little more than half the pre-war quantity, though the value had increased by 50 per cent. to £66m. Also the proportions of beef and mutton were reversed; mutton and lamb now constituted over two-thirds of the total, both in quantity and in value. Only one or two outstanding features in a kaleidoscopic situation can be noted. During the war, the saving of shipping space was especially important, so chilled beef was replaced by frozen beef, which could be packed more closely; and boned and boneless beef and veal, which formed less than 10 per cent. of the pre-war imports of beef and veal into the United Kingdom, increased to over 70 per cent. in 1942, dropping back again in later years.

The first half of the twentieth century saw other than war changes. Early in the century the biggest supply of meat to this country came from the United States in the form of beef and live cattle, but before the Second World War the supply from that source was very small, and the United States itself had become a large importer of Australian and South American meat. It is noteworthy that the modern development of Argentina's livestock and meat industry has been accompanied by the restriction of ranching and the extension of arable farming, much of the meat being produced on the relatively small farms, where fodder is grown to fatten the cattle. Normally Argentina leads easily in the supply of beef to the United Kingdom, and New Zealand in the supply of mutton and lamb, with Australia taking second place in both categories, though liable to severe setbacks on account of drought.

Other forms of meat—canned products; bacon, hams and pork; poultry, rabbits, &c.—make a bigger addition to the total than is perhaps commonly realised. In 1938 they added 12m. cwt. to the 19m. cwt. already quoted for chilled and frozen beef and mutton, and more than doubled the value, bringing the total for meat imports to over £90m. In 1952 they doubled the quantity of meat imported, increasing the 10m. cwt. of chilled and frozen beef and mutton to total meat imports of 21m. cwt.; and they more than trebled the value, raising the total to £222m. During the war and early post-war years, some of these supplementary meat imports increased greatly, but they have tended to fall again, and as the above figures show, their total quantity in 1952, as distinct from value, was no more than in 1938.

Pork, bacon, hams and lard for the British market were all for-

merly derived mainly from the United States, but before the Second World War New Zealand, Australia and the Argentine were sending most of the pork; Denmark half the bacon, and Canada, Holland, Poland and Eire most of the other half, only lard still came mainly from the United States, which during the war temporarily increased its dispatches under 'Lend-Lease'.

The tropical grasslands, particularly those of East and South Central Africa, have been the subject of optimistic forecasts of new sources of meat supply on the grand scale. In the past, any such hopes have been overshadowed by the prevalence of the tse-tse fly, which infests cattle with *nagana*, the fatal animal disease corresponding to sleeping sickness in man (p. 77); with the result that cattle are practically barred from vast areas of Equatorial Africa. After long research, a drug has been produced, antrycide, with tentative claims to render cattle immune from *nagana*. If this is confirmed by further experience, it will be a big step towards the economic utilisation of Africa's tropical grasslands, but there are many factors in the problem, and it is too soon for dogmatic assurance.

MISCELLANEOUS PRODUCTS CHIEFLY OF ANIMAL ORIGIN. There is a large world trade in eggs, for which the United Kingdom is easily the best market. Before the Second World War it imported about 3,000m. a year; or, at the rate of 16,000 eggs to the ton (the rate adopted by the United Nations Food and Agricultural Organisation), about 3½m. cwt.—half the world total of eggs entering international trade. Denmark, Holland, Poland and Eire had the biggest surpluses in Europe; in 1934–38 their respective exports averaged 1·6m., 1·4m., 0·5m. and 0·4m. cwt. Farther afield the chief exporters were China (0·4m.) and Australia (0·2m.). The largest importer next to the United Kingdom was Germany (1·7m.). In addition, the United Kingdom imported a considerable, though much smaller, quantity of eggs not in shell—mostly liquid or frozen, and only to a very small extent dried. It is significant of the demands for transport during the war that while the imports of eggs in shell and of frozen or liquid shelled eggs fell away greatly, the imports of dried eggs increased enormously. By 1950 the proportions of the trade in eggs in their various forms were tending to get back to normal, the number imported in shell being more than half the pre-war supply. Germany was then taking rather more than before the war.

The majority of eggs imported are those of domestic fowls, but the gathering of eggs from coasts and islands frequented by sea-birds, principally in northern seas, is an important source of livelihood in many places. It is not merely for food that eggs are imported. They have various important uses in the arts. The white of egg (egg-albumen) is employed in book-binding and the finishing of fancy leathers; as a clarifying agent in sugar refining and making wine; as a

means of preparing one kind of photographic paper, and for other purposes. The yolk of egg is employed in making the finer kinds of tawed leather.

Imports of **butter** into the United Kingdom before the war amounted to close on 10m. cwt. Cold storage has made possible world-wide supplies, and while Denmark supplied nearly a quarter of the total, New Zealand sent more than a quarter and Australia one-fifth. During the war, New Zealand and Australia supplied nearly all the greatly reduced supplies which were imported, though Argentina partly took the place of Denmark. By 1951 New Zealand was supplying nearly half the 6m. cwt. imported into the United Kingdom, and Denmark a third, Australia's share being reduced to less than 11 per cent. owing to lower production and increased home consumption. A formidable rival of butter is **margarine**, which is made from animal fats, vegetable oils (pp. 221 *et seq.*), or a mixture of both, and is flavoured with lactic acid ferments so as to be almost indistinguishable in taste from butter. Imports of the manufactured article, as distinct from the vegetable oils used in making it, have never been considerable. In the quinquennium before the Second World War they increased from less than 20,000 cwt. to over 100,000 cwt. (mostly from Holland); but they have since become almost negligible, whereas since the war the United Kingdom has exported 100–200,000 cwt. of margarine annually.

Cheese was formerly supplied more largely by Canada than by any other country, but before the Second World War New Zealand was supplying more than half the United Kingdom imports of 3m. cwt., while Canada sent nearly a quarter, and Australia and Holland usually between 5 and 10 per cent. apiece. A cool summer climate is a favourable condition in the cheese-making districts of both New Zealand and Canada (chiefly Quebec). During the war, cheese was notable for being imported in even larger quantities than in peace, reaching a peak of over 6m. cwt. in 1942. New Zealand retained the lead in most years, and Canada also supplied much larger quantities, but the most notable development was the appearance of the United States as a leading contributor. In 1951 the imports were nearly 4m. cwt., with New Zealand sending about half, but the dollar shortage was restricting supplies from Canada and the United States.

Fresh milk is mainly only an article of local trade; but **condensed milk**, made by adding sugar, or some other ingredients with or without sugar, to the milk, whole or skimmed, and then evaporating the milk more or less, was imported before the war to the amount of 1½m. cwt., chiefly from Holland and Denmark, Canada and New Zealand, while imports of milk powder brought the combined total to 2m. cwt. During the war years, the United States became the chief source of supply, and both condensed milk and milk powder were imported in much larger quantities. But in post-war years the

dollar shortage so reduced supplies that in 1951 the combined total was only $1\frac{2}{3}$ m. cwt.

Ghi, or butter clarified by boiling, is an article of commerce in India and neighbouring countries. **Koumiss**, the fermented milk of mares, is a favourite drink among certain nomadic tribes in central Asia, and is now largely made in Russia also, on account of its being esteemed a remedy for tuberculosis. An imitation koumiss is made for the same use in other countries from asses' and cows' milk.

Of animal products not used as food the most important are **hides and skins**, which enter largely into world trade both in the raw state and as leather at various stages of manufacture (see p. 295). Hides are preserved for and during transport either by being steeped in brine or by some process of drying. They are known respectively as 'wet' and 'dry'. The annual import of 'wet' cattle hides into the United Kingdom before the Second World War averaged about 1m. cwt., and of 'dry' hides about $\frac{1}{2}$ m. cwt., both supplied by a world-wide range of countries, headed in the case of 'wet' hides by Argentina and in the case of 'dry' hides by Australia and the Union of South Africa. Imports of sheep and lamb skins averaged well over $\frac{1}{2}$ m. cwt., mostly from New Zealand, Australia and South Africa. Goat skins, mostly 'dry' and mostly from India, with British East Africa and Nigeria as the other chief sources of supply, were imported to the average annual number of nearly 10m. skins.

During the war, and the early post-war years, the import of 'wet' hides was not only maintained but largely increased—in some years the supplies from Argentina alone were as great as the pre-war total. In 1947 the import reached a peak of nearly 2m. cwt., and it did not drop below 1m. cwt. until 1951. On the other hand, the import of 'dry' hides declined in the later war years, and though they recovered by 1947, both Australia and South Africa, which headed the pre-war sources of supply, fell very low in the list, their places at the top being taken by British East Africa and Nigeria, where much attention has been given to improved methods of drying, with great benefit to the quality of the hides. During the war, the import of sheep and lamb skins also fell below the pre-war average, but later recovered, with New Zealand, Australia and South Africa still the main contributories. Goat skins were likewise affected, and supplies from India and Africa fluctuated considerably after the war, the sequence of the individual countries as sources of supply varying from year to year. 'Wet' goat skins disappeared from the United Kingdom trade returns after 1941, only 'dry' goat skins being imported.

Of other animal products, **bones** are used in making a great variety of useful and fancy articles, and bone-ash enters into the manufacture of pottery. Bones are used also in making glue, and,

being largely composed of phosphate of lime, in making manures. The United Kingdom imports are drawn mostly from India and Argentina and have been on the increase.

Ivory is the dentine or tooth-substance forming the tusks of elephants, hippopotamuses, walruses, narwhals, and other animals. **Elephant ivory** is distinguished by its lozenge-shaped curvilinear markings. **Hippopotamus ivory** is denser and harder than that of the elephant, and of a superior and more enduring whiteness, but the solid pieces of this kind of ivory are all small, so that it can be used only in making small articles. **Walrus ivory** is inferior to that of the hippopotamus, and that of the narwhal is coarse and of little value. The total annual consumption of ivory in Europe, the United States, British India, China, and Japan was estimated towards the end of last century at, in round figures, 1,100 tons valued at £1m., the biggest consumer being the United Kingdom (350 tons). Almost all of it was elephant ivory (1,000 tons), three-fourths coming from Africa, the rest chiefly from the East Indies. The remains of the Siberian mammoth, which had supplied ivory to China for seven centuries, continued to yield a little. With the reduction of big game in Africa and measures for its preservation, trade in ivory has since declined. The annual imports into the United Kingdom before the Second World War were 100 tons or less, and during the war they almost disappeared. In 1951 they totalled 40 tons.

Under the name of **vegetable ivory** are imported the seeds of two palms, *Phytelephas macrocarpa* (Ecuador, Peru and Colombia) and *Hyphaene thebaica* (the Dum palm of the Sudan and other parts of North Africa). The seeds, known in the former case as corozo nuts, have only a fraction of the value of true ivory, and are used for making buttons and toys.

Among animal products of minor commercial value, **horns and hoofs** are imported into the United Kingdom chiefly for making combs, buttons and knife-handles; **horse-hair** as a stuffing for upholstery; **cow-hair** to make felt for roofing and for boilers and pipes of steam engines. The United States is the leading country of supply. Between 1,000 and 2,000 tons of **pigs' bristles** are imported annually for making brushes. **Feathers**, mostly for beds, are imported in still larger quantities, but surprisingly are much less valuable. They come from a world-wide range of countries, with Eire heading the list. Trade in ornamental feathers is largely dependent on the vagaries of fashion. In 1913, South Africa's exports of ostrich feathers reached a peak of 1m. lb. valued at nearly £3m.; in 1914, on the outbreak of war, the bottom dropped out of the market, and the fashion was never revived. The number of domesticated ostriches in the Union dropped from $\frac{3}{4}$ m. before the First World War to 40,000 before the Second World War, and in 1943 exports of ostrich feathers ebbed to 17,000 lb., valued at £13,000. Since then there has

been some recovery, especially in price, exports in 1949 amounting to nearly 100,000 lb. valued at £188,000.

Sponges consist of a horny internal skeleton of marine animals whose living portion consists of a coating of slime, which has to be removed before the sponge becomes an article of commerce. The animals yielding the best sponges live at a depth of only fifteen to twenty feet, and hence, when not covered by sea-weeds, can easily be seen from the surface. The sponges are generally obtained by divers, but a submarine vessel from which the fishers can seize the sponges by means of specially constructed tongs and deposit them in a basket on the bowsprit has been devised. An electric light with reflectors enables them to see the sponges through a glazed spy-hole. The best sponges are all obtained from the eastern half of the Mediterranean Sea, from the Gulf of Gabes in the east of Tunisia to the coast of Syria. In this area is also included the Dalmatian coast of the Adriatic as a sponge-yielding region. The fisheries are carried on mainly by Greeks, Sicilians, Arabs, and Dalmatians, and are best organised by the Greeks, who make the longest voyages in search of sponges and have their headquarters on the little island of Kalimno, off the coast of Asia Minor. Outside of the Mediterranean, the only important source of sponges is off the shores of the Bahamas, Cuba, and Florida, where the sponges are all of inferior quality.

Tallow and stearine (stearine is the harder ingredient in tallow) are most largely imported from Australasia (especially New Zealand) and the cattle countries of South America (especially Argentina). The former is used principally in the manufacture of soap, the latter in the making of candles. **Isinglass**, which is the finest form of gelatine, largely used in confectionery and in the arts, as well as for clarifying wine and beer, is obtained from the sound or swim-bladder of various kinds of fish, and is imported into this country chiefly from India, Brazil and (pre-war) Japan. In Russia it is largely made from the sound of the sturgeon, and in the United States from other species of sturgeon which abound in American rivers; but neither of these countries supplies much of this commodity to the United Kingdom. The thicker and less refined kinds of gelatine, including **glue** and **size**, do not enter largely into foreign commerce, but are made in large quantities from native and imported hides and bones for boiling. Even leather which is not made by tanning can be used in the manufacture of glue, but not tanned leather, for the chemical action of the tannin or tannic acid destroys the gelatine.

The most important of the **animal oils** of commerce are the produce of the **whale-** and **seal-fisheries**. One, called train oil, is derived from the blubber or coat of fat which invests these animals under the skin. Originally this kind was mainly obtained from the **right** or **Greenland whale** in the seas off the west coast of Greenland

and the northern coasts of Norway, and in the Arctic Ocean generally to the north of Norway and Iceland; but whaling in these waters had largely ceased before the First World War. The seal fisheries off Labrador and Newfoundland, and in the Gulf of St. Lawrence, were and still are prosecuted in ships specially equipped for the purpose. In the past few years there has been a considerable revival of these fisheries.

When the northern whale-fisheries showed signs of exhaustion Norwegians and others actively prosecuted whale-fisheries in the south Atlantic Ocean, both off the coast of South Africa and South America (especially round the Falkland Islands), and in the Ross Sea of Antarctica; and the southern area is now far more important than the northern. The former Dundee whale- and seal-fisheries and those of Peterhead are extinct, and so also are those of New Bedford, Massachusetts, which died out after the opening up of the Pennsylvanian oilfield. By international agreement the post-war catch in southern seas is limited to about half the pre-war average, and is rationed on the quota system. **Sperm oil** is derived from the cachalot, or sperm whale, which contains immense quantities of oil in a cavity in its enormous head. The **sperm-whale** being found in almost all parts of the ocean, this kind of oil is imported from many parts of the world. Train oil is used principally for margarine, but sperm oil, a finer and more valuable kind, yields in cold weather a kind of waxy body called **spermaceti**, which, mixed with a little beeswax, is used in the making of candles and by itself in the making of cold cream, salves, &c. A finer kind of train oil than that derived from the right whale is obtained in large quantities from the **bottle-nose whale** (*Hyperoodon rostratus*). Neither the cachalot nor the bottle-nose whale furnishes whalebone, but the former yields besides oil another valuable product, namely **ambergris**, which is largely used in perfumery, and is sometimes found in the body of the animal, sometimes floating on the surface of the water. It is a result of disease.

Of true fish oils, the most important is cod-liver oil, which is largely made in Great Britain from oil first processed aboard modern trawlers. Canada, Iceland and Norway also turn out considerable quantities from the great cod fisheries of those countries. Another important fish oil is halibut-liver oil, and a true fish-oil is made from the menhaden (*Brevoortia*); see page 250. The oil is chiefly used in leather-dressing, but also in rope-making and painting. Other animal-oils are derived from tallow, lard, bone-fat, &c. From the **dugong**, a kind of oil capable of being used for the same purpose as cod-liver oil, as well as in cooking, has been extracted in Queensland.

The following are among the animal products which, though of considerable commercial value, either do not enter into the foreign commerce of the British Isles or are too small an item to be separately enumerated in the trade returns. **Coral** is the name given to the

skeleton of a whole group of marine animals; but the red or pink coral, the skeleton of *Corallium rubrum*, is the only one of note, due to its use in the making of trinkets and other ornaments. The coral industry is specially an Italian one, and its chief seat is Torre del Greco, at the base of Mount Vesuvius, in the Bay of Naples. Formerly the chief supplies of coral were obtained by diving in the Bay of Naples, as many as five hundred boats having often set out from Torre del Greco; but the industry has lost much of its importance. The coral banks both in this bay and to the south of Sardinia have been largely exhausted, and the banks along the coasts of Algeria, Tunis and Tripoli are now more productive. **Coral** is also obtained on the coast of Catalonia; round the Cape Verde Islands; in the Adriatic, especially on the east coast; and in other places. A considerable quantity of coral was formerly exported directly or indirectly to China, where it was used in the official dress of the mandarins.

Pearls and mother-of-pearl are derived from various shells, especially of the oyster family, belonging principally to tropical seas. The mother-of-pearl is the internal part of the shell, and pearls are secretions of the same kind of matter round some small parasite or particle of inanimate foreign matter which acts as an irritant. Among the most noted pearl-fishery banks are those in the Persian Gulf, in the Gulf of Manar (Ceylon), in the Sulu Archipelago, in the neighbourhood of the Moluccas and the Aru Islands, in Torres Strait and along the north-west coast of Australia, at Tahiti, and in the Gulf of California. By providing a suitable irritant inside the shell of the oysters, the Japanese have succeeded in producing 'culture pearls,' practically indistinguishable from those formed without an artificial stimulus. Pearls are also obtained from various river-shells, especially *Unio margaritifera*, which is met with in many European rivers, including some of those of Scotland and the north of Ireland.

Parchment, the skin of sheep, and **vellum**, that of calf, prepared for writing on, no longer have the value that belonged to them before the invention of paper, but are still manufactured for use in formal documents and in book-binding. The so-called **catgut** consists of the dried and twisted intestines of sheep and other animals. It is used in making the strings of musical instruments, racket-cords, and cords used by clock-makers, polishers, &c. The intestines of larger animals serve to make **gold-beater's skin**.

The **ests** of a certain kind of swift (*Collocalia esculenta*), which breeds in caves at various places in the Eastern Archipelago, are looked upon as a luxury in China, where they are imported in millions annually. The nests are entirely made from a peculiar saliva secreted by the bird.

COMMODITIES (*continued*)

II. FISHERIES

With the oceans covering five-sevenths of the earth's surface, fisheries have, since the dawn of civilisation, held a high place in the world's economy. As a source of food supply they have grown in importance with the growth of communications. In Britain, the fishpond was prominent in monastic days, but with the coming of the railway era a century ago, sea fish began to find their way to the remotest country districts. A like development is still in progress in Germany, Czechoslovakia, and Russia, where the populations are slow to acquire a taste for sea fish.

Two main lines of advance may be distinguished in the modern industrial development of world fisheries. The more obvious is the taking of fish for immediate human consumption, as in the British trawl fishery, most of whose catch—usually kept on ice at sea—goes into consumption within 48 hours of being landed, not least widely through the agency of 30,000 fried fish shops. In contrast with this are such fisheries as the California pilchard fishery and the Icelandic herring fishery, from which the catches in the past have served primarily as raw material for extensive meal and oil plants. The meal provides animal feed, the oil is used by margarine factories in Europe.

The Food and Agriculture Organisation of the United Nations has estimated that the world production of fish (including fresh-water fish) amounts to about 25m. metric tons. Half a dozen countries accounted in 1949 for 12½m. tons, or half of the total. Heading the list, on the basis of official statistics, was Japan with 2.98m. tons—rather less than the figure for 1938, when 3.6m. tons were produced. The United States was next in 1949, with 2.55m. tons. No trustworthy statistics were available as to Chinese production in that year, but in 1948 China's production was estimated at 2.5m. tons. The U.S.S.R. was credited with 2m. tons in 1949, and Norway and the United Kingdom followed with 1.17 and 1.15m. tons respectively. (A seventh major producer was North Korea, which before the start of the Korean war was responsible for some 1.3m. tons.)

Nearly another 6½m. tons was provided by countries with a production of between a million and 100,000 metric tons. These were

Canada (870,000 tons), Spain (550), Germany (521), India (503), Burma (500), France (435), Iceland (394), Indonesia (350), South Korea (295), Portugal (283), Denmark (255), Netherlands (236), Sweden (201), Siam (196), Philippines (195), Italy (152), Brazil (145), South Africa (125), and Angola (123).

The most valuable fishing-grounds in the world consist of a chain of submerged plateaus or 'banks' in the North Atlantic, elevated considerably above the bottom of the surrounding sea, off the coasts of Canada (Newfoundland, Labrador, Quebec, and the Maritime Provinces), the New England States, and the French islands of St. Pierre and Miquelon. They very quickly attracted the attention of the early explorers who visited America. At the present day, the fisheries on the 'banks' in the open sea are free to all, but the rights of 'in-shore' fishing are limited by treaty. The treaty regulating the rights of United States fishermen in Canadian waters, and those of Canadian fishermen in United States waters, is the Treaty of London of 1818, as interpreted by the Arbitration Tribunal at the Hague in 1910, according to which the waters within three miles of the coast are reserved for the fishermen of the country to which the coast belongs; but French fishermen are allowed to fish on all the coasts of Newfoundland from Cape St. John (lat. 50° N.) on the east coast round the northern peninsula of the island, and as far as Cape Ray at the southern end of the west coast. The rights to land and dry fish enjoyed by the French under the Treaty of Utrecht were renounced under the Anglo-French Convention of 1904.

Although they have been eclipsed by the Pacific Coast fisheries (including Alaska), those of the New England States, notably Massachusetts and Maine, are still very important. The principal fish caught are cod, mackerel, hake, herring, rosefish, haddock, pollack, whiting and flounders. Others include the menhaden (*Brevoortia*) and the alewife (*Pomolobus*), which somewhat resemble the shad and are caught in immense quantities off the eastern coast of the United States from Connecticut to the Carolinas.

On the Pacific Coast the great specialities of the fishing industry are the catching and canning of pilchard, salmon and tuna for export. In 1948 both the size of the pack of tuna (nearly 7m. cases) and its value exceeded that of salmon (over 6m. cases). The salmon fishing industry is chiefly pursued in the States on the Columbia River (Oregon) and the Sacramento (California); in British Columbia on the Fraser, Skeena, and Naas Rivers, as well as several inlets; and, in recent years above all, in the rivers and creeks of Alaska. The sardine, mackerel, herring and halibut fisheries are also important commercially. Notable, as an example of the value of scientific control, is the restriction of the Pacific halibut fishery, which, instead of reducing the yield, is actually increasing it.

The chief products of the lake fisheries are whitefish (*Coregonus*), trout, 'Lake herring' (*Leucichthys*), and sturgeon. The fish of the Great Lakes were ruthlessly exploited, even being used as manure, with the result that certain types were almost exterminated and the fisheries are now relatively unimportant. The oyster-fisheries of the United States are of very great value. They are chiefly carried on in Chesapeake Bay: Maryland and Virginia being the states most largely concerned in the industry, and Baltimore the centre of the trade.

The Canadian fisheries yield, in order of weight, chiefly herring, cod, salmon and pilchards; in order of value, salmon, cod, herring and lobsters. The salmon is mainly produced in British Columbia and in the rivers of Eastern Canada. Nova Scotia and New Brunswick are important provinces in this industry, which is carefully conserved; billions of fish are hatched annually and later liberated into the rivers. In Newfoundland the production of cod is far in excess of that of any other fish.

The fisheries of the United Kingdom underwent a great change in between the two World Wars. The in-shore and middle distance fisheries, which yield the finer kinds of fish, became secondary to the fisheries in far northern waters, round Iceland and Spitsbergen and off the Murmansk Coast, where large modern trawlers made great hauls of the less-favoured food fishes, principally cod. After the Second World War it was estimated (1949) that 58 per cent. of the fish landed in Britain came from these northern waters. The round voyage takes between three and four weeks—seven days each way, out and home, and ten days on the fishing grounds—a period of absence which gives rise to various problems affecting the landing of the fish in fresh condition; while the preponderance of the coarser kinds in the total supply affects the market for fish by lessening its popularity.

The areas open to British fishing fleets off the coasts of Norway have been restricted by a post-war judgment of the International Court at the Hague, in favour of a Norwegian claim that the three-mile limit of its national waters should extend not from the shores of big inlets but from straight lines drawn between the points of entrance. More recently Iceland has claimed, in a still (1953) unsettled dispute with Britain, the right to extend the area around its coasts in which foreign fishing vessels are forbidden to operate, on the ground that certain waters are being overfished.

These and other northern fisheries are pursued chiefly from Hull and Grimsby. The waters of the North Sea are much richer in food fishes than the other waters of the British Isles, and the five leading fishing ports—Grimsby, Hull, Aberdeen, Yarmouth, and Lowestoft—are all on the east coast, the important place taken by the last two being due to a great concourse of Scottish drifters which join the local boats at the time of the autumn herring fishing. The value of

the fish caught in Irish waters is relatively small, and when the Irish herring fisheries were of notable importance before and after the First World War, the main production was by drifters from Scotland and England.

The English fisheries are more miscellaneous than the Scottish; they include herring and mackerel, pilchards and sprats among fish caught near the surface, and plaice, soles, haddock, cod and turbot among the demersal or bottom-frequenting fish, whereas in the Scottish fisheries the herring is without a rival, haddock and cod coming next. Pilchards, which are the mature form of the true sardine, are a speciality of the Cornish coasts, and though they are no longer caught in the old numbers, research has shown them to be more abundant than the present unimportant inshore fishery would seem to indicate. Besides the fishing ports already mentioned, Fleetwood, North Shields and Milford are important in England and Wales, and Wick, Lerwick, Fraserburgh, Peterhead, Stornaway and Leith in Scotland. Aberdeen is the greatest trawling centre north of the Humber. The great market is Billingsgate, in London, which tends to set the tone of trade in the country. Oysters are largely produced at Whitstable on the north coast of Kent, and at Colchester near the mouth of the Colne, in Essex. Salmon fishing in Scottish, Irish, and some English rivers is largely 'preserved' for sport and is a source of considerable wealth. There is also a valuable commercial salmon fishery, though industrial development along the banks of salmon rivers like the Tyne and the Tees has by pollution destroyed once important salmon fisheries.

The principal Norwegian fisheries are those of cod and herring. The cod-fisheries are carried on chiefly when the fish come in early spring to the spawning areas round the Lofoten Isles; to a lesser degree the fishery concerns itself with feeding cod on the Finmarken coast. The cod are mostly salted for export, but filleted fresh fish, frozen, are taking a place in world markets. The herring-fisheries are mainly in the neighbourhood of Bergen. Fish canning, especially of brisling, or sprats, is important, and between the two World Wars Norway built up an enormous export industry in canned fish of many varieties.

In the fisheries of France, sardines and anchovies, and also oysters, are of special importance. The sardine and anchovy fisheries are carried on mainly on the Mediterranean coast, the sardines of Provence being esteemed the best. The great market for the Provence fisheries is Beaucaire on the Rhone, east of Nimes. On the Atlantic side the chief seats of sardine-packing are Bordeaux and Le Mans. Sardines and anchovies are likewise caught and prepared for export on the coasts of Spain, Portugal and Italy. Oysters are produced mainly on the coasts of Brittany and other parts of the Atlantic sea-board farther south. Since about 1856 artificial oyster-

breeding has been pursued in France with great success, chiefly in the basin of Arcachon (to the south of the Gironde), and in the bay of Morbihan (on the south coast of Brittany).

Besides the sardine and anchovy the only important food-fish of the Mediterranean waters is the tunny. This fish (*Thunnus thynnus*) is a relative of the mackerel (*Scomber scomber*); it attains a length of 12 or 13 feet, and a weight of 1,000 to 1,200 lb. It appears in immense shoals in the beginning of summer, especially on the coasts of Sicily, Sardinia, and southern France. The fishery is carried on chiefly on the coasts of Sicily and Sardinia, which are visited by thousands of fishermen, foreign as well as Italian, during the fishing season. On the Atlantic coast the white-fleshed tunny (*Alalorga*) is important for the canning industry.

Russia has very important sea fisheries, and in recent years has been the second biggest producer of salmon; the fishery concessions on Asiatic rivers, chiefly to the Japanese, were important. Its river and lake fisheries, particularly in the Caspian, are also noted for their sturgeon; caviare, or the roe of the sturgeon prepared as a delicacy, is one of the most important fishery products.

As regards Asia, mention has already been made of the magnitude of the Far Eastern fisheries. Sardines, herrings, and bonitos (a large fish of the genus *Sarda*) rank high among the products of the Japanese fisheries, which also include, in the Yellow, East and South China Seas, one of the greatest demersal or ground fisheries in the world. The Philippines fishery is substantial, and, in general, fisheries play an important part in the economy and diet of the peoples of South-East Asia. In another category is trepang, a kind of sea cucumber (the French *bêche-de-mer*), which is extensively fished for the Chinese market along all the coasts of the Eastern Archipelago and Northern Australia. The production of seaweed (*Alga*) for the valuable alginic acid seems likely to develop on the Australian coasts.

The foreign commerce in fish is by no means proportioned to the productiveness of the fisheries, most kinds of fish being produced mainly for markets near at hand. The fish exports of the British Isles are chiefly herrings. Before the First World War nearly five-sixths of the British catch was exported, but the industry has never fully recovered from the loss of markets in 1914-18, due chiefly to the political and economic changes in Russia and the autarkic policy of Germany. Before the Second World War the annual landings of herrings in the United Kingdom were about 250,000 tons—less than half the pre-1914 catch. Increased landings of other fish kept the total up to about a million tons a year, of which 200,000 tons or more were exported. Within their narrower limits herrings were still the mainstay of the export trade, and this remained true after the Second World War. Both in 1950 and in 1951, about two-thirds of the exports both of fresh fish and of cured fish were herring, and so

were four-fifths or more of the canned fish exported, Germany being the chief market.

In other respects the Second World War brought about big changes, alike in the export and in the import trade of the United Kingdom in fish. Exports dropped heavily, totalling only 68,000 tons in 1950 and 63,000 tons in 1951, against the pre-war 200,000 tons. On the other hand imports of fish, which before the war were rather less than the exports, jumped up to 300,000 tons in 1947—a commentary on the shortage of meat—though they dropped to 187,000 tons by 1951, partly because of a reduction in the import of canned fish (especially canned salmon) due to the restriction of dollar expenditure. Norway has been easily first among the supplying countries, as listed in the Board of Trade returns, but the biggest item in the list is not assigned to any particular country, being attributed to 'Deep Sea Fisheries', meaning direct landings by foreign fishing vessels.

Imports of canned fish, especially salmon, had increased enormously before the war; they came not only from Canada and the United States but from Russia and Japan, and the salmon alone accounted for about a third of the total imports of fish.

By far the largest item in the exports of fish from the United States was canned salmon, a lot being sent not only to the United Kingdom but to Australia. The same was true of the large export of canned salmon from Canada. Before Newfoundland became a province of Canada, about two-thirds of the produce of the Canadian fisheries by value was exported, chiefly to the United States and (as a measure of war relief) to the United Kingdom. Newfoundland and Norway both export the greater part of the produce of their fisheries. From Norway are exported both herrings and dried and cured cod-fish. The herrings are sent chiefly to the Baltic, but the great markets for the cod-fish are the same as those for the dried and cured cod-fish which make up the bulk of the export from Newfoundland, namely Spain, Portugal, and Italy, Roman Catholic countries in which there is still a very large consumption of fish. St. John's in Newfoundland, Bergen in Norway, and Bordeaux in France are the centres of this trade. Dried and cured cod are also sent to the West Indies and South America.

The deep-sea fisheries of Germany grew rapidly after the last decade of last century, largely in consequence of state encouragement, exemplified by the provision of fishery harbours, such as those of Wesermünde, Cuxhaven, and Hamburg-Altona; by the freeing of fishing boats from harbour and pilotage dues; and in other ways. There were great developments in the trawl fishery for herrings, and a new drifter fleet was built up under the policy of self-sufficiency. Since the Second World War, Germany has taken steps substantially to redevelop her herring fisheries.

Several experiments have been made with the carriage of refrigerated fish, but the trade has not yet been developed to the same extent relatively as the trade in frozen meat, though 'quick-frozen' stocks are always held. English fish is now generally obtainable from 'cold-storage' depots in the larger cities of the tropics.

COMMODITIES (*continued*)

III. MINERAL PRODUCTS

COAL. Coal consists of vegetable matter which has been buried and sealed up out of contact with the air in past ages, and has then undergone a series of chemical changes, the general result of which is to get rid of a large proportion of hydrogen and oxygen and to increase the relative proportion of carbon in the remaining substance. In pure woody fibre the proportion of carbon present is little more than half, whereas in ordinary **bituminous coal** it may amount to from 85 to upwards of 88 per cent. The substance known as **lignite**, or brown coal, consists of vegetable matter much less altered than in ordinary coal, and contains a smaller relative amount of carbon, say 70 per cent. In certain situations, the process of removing hydrogen and oxygen has gone further than in the formation of bituminous coal, and as much as 94 per cent. of carbon may be present. There is then formed a kind of coal called **anthracite**, which is lustrous on the surface, does not soil the fingers, is difficult to light, burns with little or no flame, but produces an intense heat when it does burn. **Coke**, an artificial product made by heating bituminous coal in closed vessels or ovens, and removing the more volatile constituents, contains as high a proportion of carbon as anthracite, but the product acquires in the process a highly porous or vesicular structure along with hardness and density. It is these properties that make it so valuable in the blast-furnace, its hardness enabling it to resist crushing by pressure, and its porosity presenting a greater amount of surface to the action of heated air. Formerly the removal of the volatile constituents was effected by carbonising the coal in beehive ovens, which produced excellent coke but did not conserve the gases which were given off, and destroyed such valuable constituents as tar, benzol, and ammonia. These ovens have now been almost entirely replaced by others which separate all the by-products.

Supplies of coke are derived to-day from three main sources. (1) In the manufacture of gas for lighting and heating, gasworks produce large quantities of coke which are mostly used for domestic purposes as fuel for hot-water boilers, closed stoves, and central heating. The coal is carbonised in various types of 'retort', both

horizontal and continuous vertical, the latter being the more modern, and producing a more reactive and hence more suitable coke for domestic uses. (2) The collieries manufacture for sale to industrialists a harder and more lumpy kind of coke, used almost exclusively for blast furnaces and metallurgical purposes. The 'ovens' for making this quality of coke are large vertical chambers, each of which may contain as much as 10 tons. (3) In recent years there has been a marked tendency for steelworks to build their own batteries of coke ovens, with double benefit: they can select for carbonisation coal which will yield a coke of the particular quality they require, and the ovens can be heated—in part at any rate—by blast furnace gas, thus releasing the high-grade coke oven gas for the steel furnaces and other purposes at the works.

In 1937 the quantity of coal carbonised was over 41m. tons, divided almost equally between gasworks and other producers; and the resulting quantity of coke and breeze was 27m. tons. There was little variation in these figures during the war years, 1939–45; afterwards the quantity increased slightly, and in 1950 the production of coke and breeze in Great Britain was nearly 31m. tons—14·4m. tons from gasworks and 16·4m. tons from coke-ovens.

It is known that coal was worked at several places in Roman Britain, but it seems to have been little used in Anglo-Saxon times. The first proper coal-mines are said to have been opened at the close of the twelfth century (1198) in Belgium, and it is long before we hear of a trade in Newcastle coal. In 1615 that trade employed 400 vessels in distributing coal over England. In 1660 the total coal production of England was estimated at less than two and a quarter million tons, or about two-fifths of a ton per head.

The vast increase in the use of coal in recent years has been due chiefly to the requirements of modern factories, of railways and steamers, of blast furnaces, gasworks, and electrical installations. At the beginning of the nineteenth century, after the invention of the steam-engine and its application to spinning machinery, but before the invention of steamboats, as well as before the introduction of railways, and before coal gas came into general use for lighting, the production of coal in England is estimated to have been 10m. tons, equal to about five-eighths of a ton per head for the estimated population of the United Kingdom. The contrast between these figures and the position in the half-century prior to the Second World War is shown, along with other comparative data, in the diagrams and tables on pp. 261–263.

The Royal Commission on the Coal Industry (1925) gave figures showing the approximate consumption of coal in the United Kingdom in 1924,¹ and these have made it possible to draw up the

¹ Report of the Royal Commission on the Coal Industry (Cd. 2600, 1926, p. 11).

Percentage Analysis of the Consumption of Coal

UNITED KINGDOM (1924).	GERMANY. (1913)	UNITED STATES (1923).
Domestic . . . 12.9	Domestic . . . 9.1	Domestic . . . 12.8
Pig-Iron manufac- ture . . . 5.4	Briquetting plants 3.5	Coke ovens . . . 15.6
Electric power pro- duction . . . 3.0	Coke ovens . . . 23.4	Iron and Steel works 5.6
Factories . . . 26.8	Public purposes . . 2.9	Electric power pro- duction . . . 6.8
	Industrial . . . 10.0	Factories (General industrial) . . . 21.5
Miners' Coal . . . 2.5	Factories . . . 14.1	Agriculture . . . —
Coal Mines . . . 6.3	Agriculture . . . 4.0	Mines . . . 2.4
Railways . . . 5.1	Mines . . . —	Railways . . . 28.8
Bunker Coal, ex- ternal trade . . 6.7	Railways . . . 9.3	Bunker coal, exter- nal trade . . . 1.0
Do., coasting trade 0.5	Navigation . . . 5.3	Do., coasting trade 0.6
Gas . . . 6.3	Gas . . . 5.3	Gas . . . 1.0
Export . . . 24.5	Export . . . 13.1	Export . . . 3.9
100.0	100.0	100.0

above table, showing a percentage analysis of the total, along with more or less corresponding figures for Germany in 1913 (taken from or based on those given in W. A. Bone's *Coal and its Scientific Uses*, pp. 478, 479) and the United States in 1923.¹ So far as these figures correspond with one another the most striking differences are under the heads of export, railways, and bunker coal, and are significant of geographical differences between the three countries. Long before 1914, the British export of coal had been expanding at a more rapid rate than the production, and in 1913 the coal² exported from the United Kingdom was 26.7 per cent. of the total production of 290m. tons. This heading is one indication of the same geographical advantage as is revealed also by the high proportion of bunker coal used in the United Kingdom, while the high proportion of coal used on the railways in the United States is equally significant of the enormous land area and internal land trade in that country.

The table on the facing page shows the great change from the nineteen twenties, when British export of coal was still large, to the position in 1950, after the Second World War, when Britain was struggling to produce enough coal for home consumption and to rebuild an export. It must be emphasised that the trouble is not shortage of coal but shortage of miners.

The year 1913 marked the climax of the prosperity of the coal-mining industry in Great Britain. During the war years 1914–18 the industry was under Government control; export prices rose so high

¹ The Mineral Industry, 1925, p. 149 (Bituminous coals only).

² Inclusive of coke, cinders, and patent fuel.

that much of the export trade was lost and foreign fields were stimulated into active development. In 1920 the output had fallen to 230m. tons and exports to 19 per cent. of the output. A gradual recovery followed, only to be succeeded by the disastrous year 1926 when, owing to labour troubles, production fell to 125,539,300 tons and exports to 20,596,571 tons.

Percentage Analysis of the Consumption of Coal

UNITED KINGDOM				1950
Domestic	.	.	.	15.0
Coke ovens	.	.	.	10.4
Electric power production	.	.	.	15.2
Factories	.	.	.	25.1
Miners' Coal	.	.	.	2.3
Coal Mines	.	.	.	4.9
Railways	.	.	.	6.8
Gas works	.	.	.	12.1
Coastwise bunkers	.	.	.	0.4
Export	.	.	.	7.8
				100.0

In 1937 the royalty rights in coal mines were nationalised at a cost of £66,450,000. Production in that year reached 240m. tons and exports 43m. tons. But in 1938 production fell again to 227m. tons (exports, 38m. tons), and in 1939 any hopes of early recovery were dashed by the Second World War. The output of saleable coal declined to 174m. tons in 1945, and for some years after the fighting ceased not only were home supplies severely rationed but the export trade in coal was almost suspended, with disastrous effects on the national economy. Coal used to provide one-tenth of the total exports in value and four-fifths in volume. In the words of the Royal Commission (1925): 'By furnishing outward cargo for a large amount of shipping it cheapens freights for the imports.'

Out-of-date conditions in some of the mines and discontent among the miners were both limiting factors in production. In the hope of meeting the need, the coal-mining industry was nationalised in 1947. Wages were increased, hours of work reduced, and a five-day week was established, while schemes for improving the equipment of the mines were put in hand. Production in 1947 fell just short of the Government 'target' of 200m. tons, and in 1948 a beginning was made with the revival of the export trade, though the restrictions on home consumption remained. In 1951 the production of saleable coal reached 222m. tons, but exports were under 8m. tons (they had been nearly 14m. tons both in 1949 and in 1950), and coal shipped for bunkers was under 4m. tons. The effect of the improved conditions

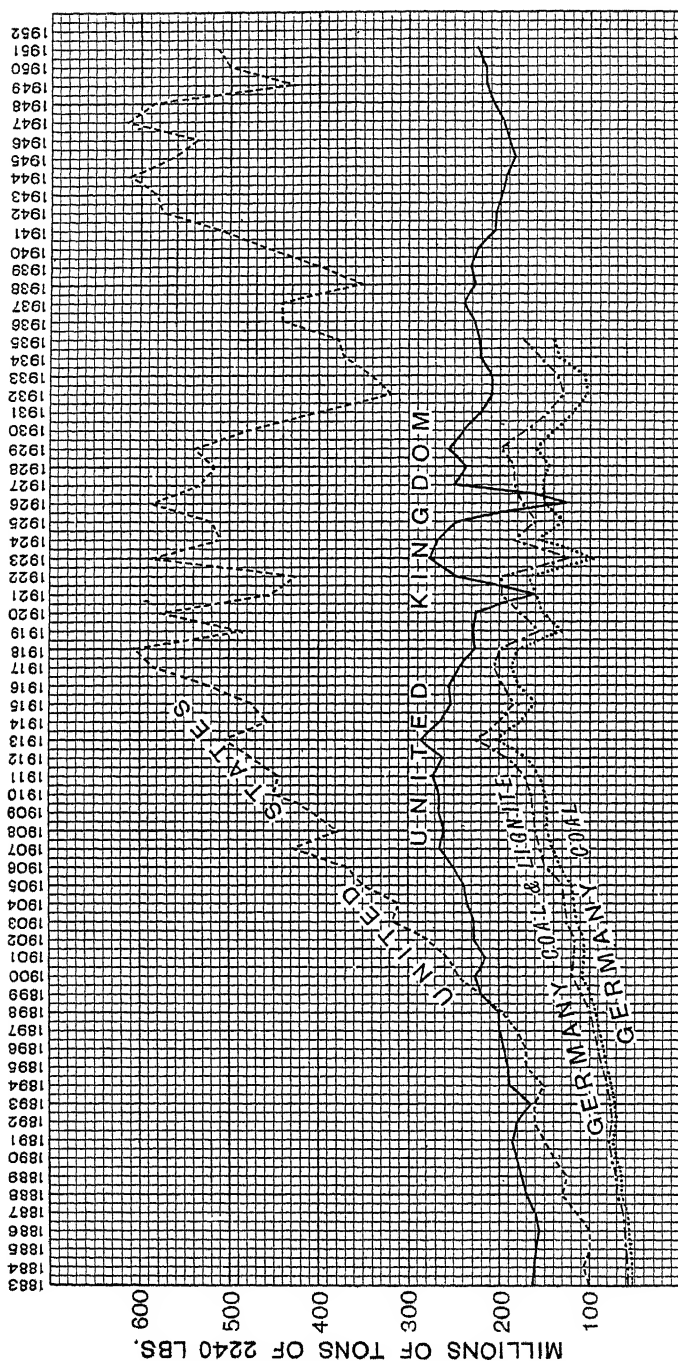


DIAGRAM I.

COAL PRODUCTION SINCE 1883.

In drawing the line for coal and lignite (Germany) the lignite has been estimated in accordance with German practice in the ratio of 9 : 2 coal. Germany from 1922 includes the Saar Basin.

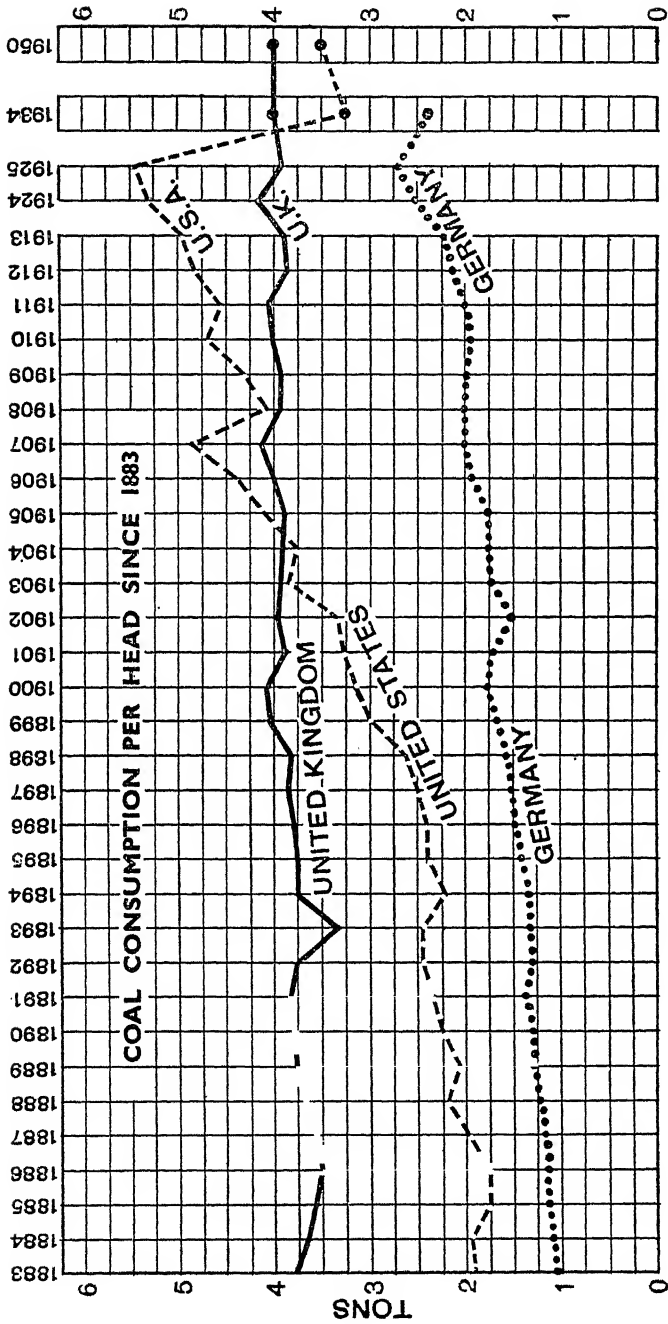


DIAGRAM II.

of labour in sending up the price of coal was felt both at home and abroad, and will necessarily be a factor in the future development of the export trade.

There have been many speculations as to the future of the coal supply of the world as a whole and of particular countries. The vast extent and content of the known coalfields of the world as shown in

Country.	Estimated Reserves. ¹ Thousand Millions of Tons (Anthracite and Bituminous Coal only).	Average Annual Production in Millions of Tons. ²				
		1881-85.	1906-10.	1935.	1945.	1950.
United Kingdom	190	158.9	261.7	226.5	182.8	216.3
Australia	133	2.5	9.3	9.8	18.3	23.9
Canada	286	1.6	9.7	12.6	14.7	17.1
India	76	1.2	11.5	21.2	29.2	32.4 ³
New Zealand	1	0.4	1.9	2.1	2.8	2.7
Union of South Africa	56	—	5.2	13.1	23.2	26.1
Austria-Hungary	40	7.7	14.8	—	6.3	4.4 ⁴
Czechoslovakia	28	—	—	11.0	26.6	45.2
Poland	80	—	—	28.7	26.9	81.5
Netherlands	—	—	—	12.0	5.1	12.2
Belgium	11	17.3	23.3	26.5	15.6	26.9
China	250	—	—	27.2	— ⁵	— ⁵
France	16	19.4	35.6	46.2	34.5	51.7
Germany	350	53.6	142.6	143.0	158.4	185.2 ⁶
Japan	7	1.1	14.3	33.1	23.6	39.1
U.S.S.R.	1,080	3.8	24.6	103.8	140.7	252.0 ⁷
Spain	8	1.0	3.6	5.9	11.9	12.1
United States	1,975	95.5	405.9	378.9	564.8	496.5

¹ From *Coal Resources of the World*, a report presented to the Twelfth International Geological Congress, Toronto, 1913, revised in 1933 for China, Russia, Germany, Poland and Czechoslovakia.

² The coal production of the world is subject to big fluctuations. Estimated at 1,320m. tons in 1913, it was down to 1,072m. tons in 1935; after greatly intensified production during the Second World War, the total dropped in the reaction of 1945, but was still reckoned at 1,344m. tons, and in 1950 it was up again to nearly the highest level of the war years, with an output of 1,722m. tons.

³ Including Pakistan (0.4).

⁴ Austria only; production figure for Hungary not available.

⁵ Not available.

⁶ Western Zones only.

⁷ Estimate.

the first column of figures set out in the above table removes, indeed, any fear of the using up of the coal-supply of the world to the remote future. With regard to the coal supply of any particular country¹ or region, however, it must be borne in mind that so far as the prosperity of such country or region depends on cheap coal, that prosperity will

¹ The second Royal Commission on the Coal Supplies of the United Kingdom estimated the total quantity of available coal in the United Kingdom in seams of 1 foot in thickness and upwards, down to a depth of 4,000 feet, at 100,915m. tons in proved coalfields and 39,483m. tons in unproved coalfields—a total of 140,398m. tons.

Later estimates, on the same basis, by Sir Aubrey Strahan (1912) gave 178,727 millions of tons; whilst Professor H. S. Jevons in 1915 gave an estimate of 197,000m. tons.

be more or less affected as soon as the price of coal begins to rise relatively to other countries or regions. As to the future of the coal production where large deposits of coal still remain to be utilised, it is impossible to prophesy; the conditions which determine whether a coalfield is worked or not are too numerous and uncertain. Much depends upon the quality of the coal, the situation of the coalfield, the ease with which the region can be supplied with coal from elsewhere, or with power from other sources, and much also on the habits of the people. As falling water is now so important a competing source of power, it should be mentioned here that where there is plant for continuous development of power by this means one British horse-power hour (=500 foot-pounds=746 watts) is equivalent to the consumption of 2 lb. of coal. With continuous working, therefore, on 300 days in the year, a horse-power year would be equivalent to the consumption of over 6 tons in that time. Thus Canada's developed water-power resources represent a saving of coal of 66m. tons per annum.

The chief geographical considerations in connection with coal, apart from its distribution locally and the accessibility of the seams, arise from the cost of carriage and the consequent economic motive of avoiding carriage wherever and so far as possible. When coal is made dear by difficulties of transport, there is every inducement to make the best provision practicable to secure its efficiency where it cannot be dispensed with. In Switzerland the most efficient steam engine was developed and used much earlier than in Great Britain. In other cases coal may be replaced by some locally cheaper even if less efficient fuel or by the use of water-power. Even where coal is the source of the power used, its carriage may be largely avoided by the electrical transmission of the power, and the higher transport costs become the greater is the inducement to resort to this method of utilising fuel. This has been well illustrated in the last few years in Britain in connection with the development of the electricity 'Grid'. Most of the primary generators are either on the coalfields, *i.e.* the electricity is pit-head carbo-electricity, or are situated where they can receive bulk supplies of coal direct by water (*cf.* pp. 72-3).

Lignite, as the name indicates, is a woody kind of coal, sometimes of a brown colour; in Germany it is known as brown coal (*Braunkohle*). It is largely produced in Germany, Czechoslovakia, Austria, Australia, and Canada, as well as in the United States. Its heating value in proportion to that of true coal is reckoned in Germany to be about 5 : 7, but its price is only about half that of true coal, which limits its range of transport. Before the Second World War, Germany used a great deal of Czechoslovakian lignite, which was as a rule of better quality than the German; but since the war, Germany has had only her own production of lignite. Most of this is used for making briquettes, a favourite form of fuel for both indus-

trial and domestic purposes. There is obviously a great advantage in using lignite where mined to generate electricity. Thus Melbourne, Australia, is supplied with electricity from the Morwell lignite deposits.

The immense superficial deposits of peat in Ireland, Scotland, Germany, and elsewhere, are still for the most part of even more restricted utility. Experiments with Irish air-dried peat showed that on the average the heating power of coal was as 1 : 1.77 by weight and 1.5 by volume of peat. Nevertheless peat is beginning to acquire increased importance in some places in connection with electricity. In Germany, Professors Frank and Caro succeeded in adapting the Mond gas-producer to the use of peat for the production of electric power with commercial success, tar and sulphate of ammonia being obtained as by-products. As the yield of the sulphate is likely to be an important factor in the profitableness of such an undertaking, the richness of the peat in nitrogen, which varies considerably, will affect to a large extent the availability of different deposits for this purpose.

PETROLEUM AND ITS PRODUCTS, with other allied substances. Petroleum, which means rock-oil, is a general name given to oils which flow freely or are pumped from holes bored in the earth. From the crude oil as it issues from the earth numerous products having a great variety of uses are made by distillation and other processes, these products differing from one another in weight and fluidity, as well as in other properties. The names given to these products are variously used in different places, which is the source of a good deal of confusion. The name of kerosene is now very generally given to a light kind of oil which is that most abundantly produced for use in lamps. Heavier kinds of oil, to which various names are given, are better adapted for heating purposes, and heavier oils still are very abundantly produced for use as lubricators for machinery. These heavy oils are what are generally known in the United States as paraffin oils, but in England this name had previously been given to an oil prepared from a different material for lighting, and hence in this country the light petroleum of the Americans is frequently sold as paraffin oil. But the development of the internal combustion engine has made gasoline or petrol the product of petroleum which is now of the greatest importance. In the process of distillation it is the lightest fraction and the first to come off. Crude oils vary in their richness in petrol; when a crude oil yields large quantities it is almost certain to be refined to yield a maximum of petrol. Indeed the yield is now commonly increased by the process known as 'cracking' whereby the heavier fractions are split chemically into petrol and still heavier oils. Only in those cases where the crude oil is poor in petrol is it likely that it will be used direct as fuel for steamships, a large proportion of which—both liners and battleships—now burn oil in

place of coal. The development of the Diesel engine has given a use to oils heavier than petrol, whilst the world-wide increase in the use of electricity has resulted in a decreased demand for kerosene and other lighting oils. On the other hand, the cheap mineral oils have replaced vegetable and animal oils for lighting purposes in all parts of the world. Similarly as lubricants the derivatives of mineral oil have replaced vegetable and animal oils (except in special cases, such as castor oil as a lubricant for aircraft bearings) since they are less likely to become gummy and adhesive.

Amongst the end products from the distillation of mineral oil may be noted bitumen or asphalt (for roadmaking and similar purposes) and paraffin wax (used in candle-making). Vaseline (a proprietary preparation of petroleum jelly), medicinal paraffin (a gentle aperient), and batching oils (used in the softening of flax and other tough fibres), are also obtained from certain oils.

Similar products can be obtained by the destructive distillation of oil shales. The shale-oil industry has long been established in the midland valley of Scotland, but of recent years has suffered from the exhaustion of the richer shales (which yielded as much as 80 gallons per ton of shale) and the competition of the more cheaply produced crude oils. There are vast deposits of oil shale in many parts of the world which will be worked when a rise in crude oil prices or the invention of more efficient retorting processes renders their exploitation economically possible. Low-grade coals may also be used, and indeed coals of all types. Those countries such as Britain which are rich in coal but poor in mineral oil have turned their attention to the production of oil from coal. There are two chief processes whereby this can be effected. One is low temperature carbonisation whereby the coal is converted into a valuable smokeless fuel (coalite) and oil which can be refined as required. The other is the hydrogenation process whereby coal is combined with hydrogen at high temperature and under high pressures, thus converting the whole into crude oil from which a large yield of petrol can be obtained. Large works for the hydrogenation of coal were established by Imperial Chemical Industries Ltd., at Billingham-on-Tees, but the process is no longer economical, and hydrogenation is now carried on with creosote pitch mixture.

The petroleum industry on a great scale is entirely modern, and has attained its present dimensions in consequence of the abundance of the supplies that have been discovered in certain regions, the great utility of its products, the ease with which it can be extracted from the earth and transmitted long distances in pipes, and the consequent cheapness of its products. The existence of petroleum was known even to the ancients, being mentioned by Herodotus, Plutarch, and Pliny; but the great development of the industry has taken place since the oilfields of Russia and the United States began to be worked.

The rapid increase in the world's production of petroleum will be apparent from the table given below. The rise from about 1910 or 1912 to 1923 was largely due to a succession of new fields being discovered in the United States, where production increased from 35.5m. tons in 1913 to 97.7m. tons in 1923—representing an increase of about 435m. barrels.¹ A decline during the world depression in the early thirties was followed by a further rise, stimulated by the demands of the Second World War. In general, it is true to say that output is maintained or increased by the continued discovery of new fields. This cannot continue indefinitely, and the expectation is that the world's crude oil supplies will be exhausted long before those of coal.

World Production of Crude Petroleum in Million Barrels

1903 . . .	195	1936 . . .	1,792	1944 . . .	2,592
1913 . . .	385	1937 . . .	2,039	1945 . . .	2,595
1923 . . .	1,016	1938 . . .	1,988	1946 . . .	2,745
1929 . . .	1,486	1939 . . .	2,085	1947 . . .	3,023
1932 . . .	1,310	1940 . . .	2,142	1948 . . .	3,433
1933 . . .	1,442	1941 . . .	2,227	1949 . . .	3,398
1934 . . .	1,522	1942 . . .	2,009	1950 . . .	3,783
1935 . . .	1,655	1943 . . .	2,257	1951 . . .	4,277

Output of the Chief Petroleum Countries before and after the Second World War.

NEW WORLD	Million Barrels.		OLD WORLD	Million Barrels.	
	1938.	1951 ²		1938.	1951 ²
U.S.A. . .	1,214.36	2,244.40	U.S.S.R. . .	208.78	287.50
Venezuela . .	188.17	622.19	Saudi Arabia . .	0.50	277.96
Mexico . . .	38.51	77.09	Kuwait . . .	—	205.13
Canada . . .	6.97	47.11	Iran . . .	78.37	128.50
Colombia . . .	21.58	38.15	Iraq . . .	32.64	61.53
Argentina . .	17.08	24.41	Indonesia . . .	57.32	55.35
Trinidad . . .	17.74	20.53	British Borneo . .	6.91	37.47
Peru . . .	15.84	16.11	Roumania . . .	48.49	27.00
Ecuador . . .	2.25	2.72	Qatar . . .	—	18.10
			Egypt . . .	1.58	16.30
			Austria . . .	0.38	15.01
			Bahrein . . .	8.30	10.99
	1,522.50	3,092.71		443.27	1,140.84

The 'New World' countries in the above table provided 76.6 per cent. of the world output of petroleum in 1938, and the 'Old World' countries 22.3 per cent. In 1951 the corresponding percentages were 72.3 and 26.7.

The following notes on the chief producing countries are given with due reserve. Development and decline are so rapid that any account tends to be out of date almost as soon as it is written.

¹ The relation between barrels and tons varies with the country in question, ranging between 7 and 8 barrels to the long ton (2,240 lb.). In the case of the United States, the conversion rate is 7.3 barrels to the long ton.

² Estimates prepared by the journal *World Oil*.

United States. In the United States the productive oilfields lie in groups in several areas. The first extensive development took place in the eastern states, where a great oil region about 160 miles in length, and 40 miles broad in the middle, stretches from south-west to north-east through the western parts of the States of Pennsylvania and New York. Oil was observed on the surface of the ground within this region as far back as 1819, but the first company for utilising the oil was formed in 1853, and at first the only method of collecting the oil was by spreading cloths over the ground to soak it up. Oil was first reached by boring in 1859, and it is since then that the oil industry of the United States has sprung up. There are now thousands of miles of pipes, through which oil from the individual wells or groups of wells is run into great central refineries. What are called Pipe Line Certificates are issued to the proprietors of the wells in proportion to the amount of crude oil which they run into the pipes for refining.

In 1885 nineteen-twentieths of the United States crude oil came from the Pennsylvanian fields. Since then the proportion has steadily diminished. Another group of fields lies to the south of the Great Lakes, in the States of Illinois, Indiana, and Ohio. The mid-Continent Fields lie in the States of Kansas and Oklahoma. Among them are many remarkable for the enormous production attained within a few months of their discovery. The Gulf Coast Fields, as the name implies, lie near the coast of the Gulf of Mexico in the State of Texas.

Even more remarkable have been the oilfields of the southern part of the State of California. The fields are centred round Los Angeles and are largely the cause of the rapid rise of that town. California became the foremost producing state of America and the exploitation of its oil resources has been characterised by the remarkable series of 'giant producers,' brought in one after another. Before the Second World War a decline set in, and both Texas and Oklahoma went ahead of California; but during the war, while Texas and California soared to new heights, Oklahoma fell back. States producing over 3m. barrels in 1949, when the total was 1,840m. barrels, were:—

	Million Barrels.		Million Barrels.
Texas	743.99	Colorado	23.93
California	332.84	Michigan	16.50
Louisiana	190.72	Pennsylvania	11.37
Oklahoma	151.90	Indiana	9.56
Kansas	101.87	Montana	9.15
Illinois	64.58	Kentucky	8.66
New Mexico	47.93	New York	4.25
Wyoming	46.94	Ohio	3.43
Mississippi	37.97	Other States	4.47
Arkansas	29.94		
		Total, U.S.A. . . .	1,840.00

Despite the enormous increase in output, the home demand has kept up with the supply, and while there is a considerable export trade, largely in motor fuel and lubricating oils, there is a still bigger import trade, chiefly in crude petroleum and residual fuel oils.

Canada. Canada's chief oilfields are in Alberta. Since the Second World War there have been notable developments, especially around Edmonton, as the result of discoveries made there in 1947. By 1951, Canada's annual production, which during the war had been about 10m. barrels, afterwards dropping to 8m., had jumped up to 47m. barrels; and in the following year Alberta alone was credited with over 3,400 oil wells, producing at the rate of nearly 60m. barrels a year. Already a pipeline was taking the oil eastward to the Great Lakes, and another was completed in 1953 to take it westwards across the Rockies and through British Columbia to Vancouver. Simultaneously there was a big development of plans for utilising Alberta's abundant supplies of natural gas, from which can be extracted petro-chemical products—*butane, ethane, propane, etc.*—now in great demand. Alberta accounts for 90 per cent. or more of Canada's total production of petroleum, the balance being provided by Ontario, New Brunswick, and Saskatchewan.

Mexico for long occupied second place amongst oil producers; in 1921 its output formed 29 per cent. of the world's total. Legislation and the disturbed state of the country interfered with the industry. Many of the wells became exhausted and no comparable new supplies were found. Elsewhere new fields were being tapped. As a result, for some years Mexico has produced under 2 per cent. of the world's total, though with the growth of world production Mexico's actual output has lately shown renewed development. The fields lie near the Gulf Coast, around the port of Tampico.

South America. The countries of South America rapidly assumed great importance, especially Venezuela, now the world's second producer; its oilfields lie around the shallow Gulf of Maracaibo. Colombia, Argentina, and Trinidad, Britain's West Indian island off the coast of Venezuela, are next in rank and made substantial progress in the Second World War, though their combined output is only a fraction of that of Venezuela. Lower in the scale, and with a big gap between them, Peru and Ecuador remain more or less at their pre-war levels. Except in Argentina, where the production is largely in Government hands, exploitation in South America is chiefly by British and American companies.

Russia has not only a large output but great potentialities. The Trans-Caucasian oilfields belong to a larger region, extending from the Crimea in the north-west along both sides of the Caucasus, and along the northern frontier of Persia to Merv and Sarakhs in the south-east, a region in which petroleum is known to exist at many points; but there are two small districts, one near the Caspian Sea,

and one near the Black Sea, both on the south side of the Caucasus Mountains, in which the supply of oil in this region is peculiarly abundant. One of these is the district round Baku, on the peninsula of Apsheron, which juts eastwards into the Caspian Sea. In this district, which is by far the richer of the two, inflammable oils have been known to exist from a very remote period, and gases burning constantly as they escape from the earth were visited for ages by Persian fire-worshippers; but it was not till long after this territory finally passed from Persia to Russia, early in the nineteenth century, that any attempt was made to utilise commercially its wealth in oil, and not till the latter part of that century that its working was taken in hand in earnest. In 1900 a pipeline over 140 miles long was opened from Baku to Mikhailovo, near the eastern end of the Suram tunnel, and this line was afterwards continued to Batum. Petroleum is produced also in other parts of Trans-Caucasia, and more abundantly in the Grozny and Maikop districts of Cis-Caucasia. Notable too is the Volga-Ural oilfield (between the Volga and Ural rivers, including the southern section of the Ural range), which is estimated to contain one-third of the known reserves of petroleum in Russia.

In Europe outside Russia the principal districts producing mineral oil lie on the outer slopes of the Carpathian Mountains, with Roumania as the country of largest output. Next comes Austria. The principal Austrian oilfield is around Zistersdorf, in the Soviet zone of occupation. British enterprise was active in its early development before the Second World War, when the annual production reached about a quarter of a million barrels. Intensive German exploitation during the war increased this output thirty- or forty-fold and though production slumped in the early post-war years it has since reached new heights. Germany also produces some of its own requirements of oil. France is the only country to practise the mining of oil sands (at Pechelbronn). During the 1914-18 War much money was spent in prospecting for mineral oil in England, but despite a small production from a bore at Hardstoft, in Derbyshire, the attempt was a failure. A renewed search, begun in 1936, was more successful. Fields were found in both England and Scotland, and the annual production rose to a peak of 800,000 barrels in 1943.

Asia. In Asia, Burma maintained an output of about 8m. barrels a year before the Second World War, but after the war, production dropped to less than 100,000 barrels. There are small fields in the Punjab and Assam. Indonesia, as the Netherlands East Indies, yielded large supplies before the Second World War (up to 50m. barrels and more in a year), and though production dropped to little more than 2m. barrels in the post-war troubles, it has now reached its old figure. In British Borneo, which comprises North Borneo, Sarawak, and Brunei, there has been a notable post-war development. There are closely associated oilfields in Sarawak and Brunei, which

have long yielded useful supplies, but in the last few years Brunei has leaped into prominence. It is accountable for most of the 37m. barrels credited to British Borneo in 1951, and now ranks next to Canada as the leading source of supply in the Commonwealth.

A very important field was worked in Persia (Iran) during the first half of the twentieth century by the Anglo-Iranian Oil Company, in which the British Government became a shareholder in 1914 to the amount of £2m. In the spring of 1951, while proposals to increase the share of the profits payable to Iran were being negotiated, the Iranian Government nationalised the industry and repudiated the concession to the oil company. In the absence of an amicable settlement, exports of oil from Iran ceased, the company withdrew from the country, and in the autumn of 1952 the Iranian Government broke off diplomatic relations with the United Kingdom. Pending a way out of this *impasse*, the oil industry in Iran is practically at a standstill.

Increasingly important as were the supplies from Iran—over 250m. barrels in 1950—their suspension for the time being has been offset on the world's markets by the spectacular increases in production in other parts of the Middle East, especially Saudi Arabia (now crossed by a pipeline from the Persian Gulf to the Mediterranean) and the Sheikdom of Kuwait, at the head of the Persian Gulf, each of which was practically non-productive before the Second World War, but each of which in 1951 yielded between 200m. and 300m. barrels. Iraq also has largely increased its production and is still on the up-grade, aided by a new oilfield which has been opened up near the head of the Persian Gulf. Pipelines to convey oil from the older fields in Iraq to the Mediterranean at Tripoli and Haifa were built in 1935 and operated successfully till the troubles in Palestine after the war, when the pipes were cut by the Arabs. This political difficulty has been overcome by laying pipelines which avoid Israeli territory. In 1952 the Iraq Petroleum Company had three lines running from Kirkuk, the chief centre of supply, to the Mediterranean—two serving the port of Tripoli, in the Lebanon, and one connecting with Banias, on the Syrian coast.

A new source of supply which has made a promising beginning is the Sheikdom of Qatar, on the Persian Gulf; and on a smaller scale the Bahrein Islands in the Gulf continue to be a source of steady supply.

Other Countries. In Africa the principal oil wells are those of Egypt, on the west coast of the Red Sea, opposite the end of the Sinai Peninsula. In Australia the search for oil has mostly failed; a hopeful strike was made in the extreme west in 1953. Oilfields are being worked in Dutch New Guinea, and sought for in Papua.

Ozokerit or earth-wax is a natural product resembling solid paraffin. It occurs in large quantities near the Caspian Sea, but the

chief commercial supplies were formerly drawn from Drohobycz and other places in Galicia (Poland). Germany exported large quantities during the Second World War. It is difficult to refine, but yields a peculiarly fine kind of wax very suitable for making candles of a high melting-point. The light given by such candles is as 10 : 7·5 of that from sperm, and as 10 : 7 of that from wax candles.

Asphalt or Mineral Pitch is a solid or nearly solid substance which results from the evaporation of the lighter fractions of natural oil or the thickening of petroleum through the absorption of oxygen, and is hence met with in nature either as a superficial layer above deposits of petroleum exposed to the air, or entirely occupying the place of such deposits so exposed. It is largely used for surfacing roads and side-walks. The chief source of supply of natural asphalt is Trinidad's famous Pitch Lake, where production after the Second World War rose to 155,000 tons in 1951. Argentina has developed production of a kindred product, asphaltite, but output declined after the war to 77,500 tons in 1949. In the United States another kindred product, Gilsonite, has reached an annual output of 45–60,000 tons. Asphalt Rock is still more largely produced in the United States, where sales at the half century amounted to over a million tons a year; it is also produced extensively in Italy (up to a quarter of a million tons a year). In Switzerland the cantons of Neuchâtel and Vaud are noted for the quality of their asphalt. One of the names of the Dead Sea in ancient times was the Asphalt Lake.

GOLD and SILVER. A table on the next page shows the world production of gold and silver and the output in leading countries in 1912, 1938, and 1950—that is, before the First World War, before the Second World War, and five years after the close of hostilities. In both cases (gold and silver), countries are shown in descending order of production in 1938, when the high price of gold, in terms of sterling and other 'devalued' currencies, had led to a great resuscitation of mining. In the Second World War the mining of gold and silver, unlike the production of petroleum, came to be of secondary importance. It will be seen that, in almost all the countries listed, gold production in 1950 was less than in 1938. The world total for 1950 was less than two-thirds of the pre-war figure, and the countries listed in the table, despite their smaller output, still provided 90 per cent. of the total. Among other sources of gold supply may be noted the Belgian Congo (0·34m. fine ounces troy) and the Philippines (0·33m.), both of which have produced more largely in the past.

The figures for silver tell much the same tale. The countries listed provided 88 per cent. of the diminished total in 1950, and noteworthy among the remaining sources of supply were the Belgian Congo (4·46m. fine ounces troy) and Honduras (3·51m.).

For the last fifty years, the biggest factor in the world's supply of gold has been South Africa, and there almost wholly the Trans-

vaal, which in 1951 provided 11,487,000 fine ounces out of a total of 11,517,000 fine ounces for the whole Union. In 1898, the year before the Boer War, the value of the gold produced in the Transvaal was £16m. After increasing steadily year by year from 1902 till 1912, when it amounted to £38·7m., the value of South Africa's gold production began to decline, and in 1922 it had dropped to £29·8m. A rapid rise followed and the value reached £44·2m. in 1929. During the Second World War it increased to over £60m. (both in 1941 and in 1942), but in 1949 it was down again to £49·7m. This was at the standard value of very nearly 85s. per ounce fine, applied to an output of 11·7m. fine ounces; but at the average price realised, the market value latterly has been about double the standard value.

The gold production of Russia is not exactly known but probably ranks second to that of the Transvaal.

*Production of Gold and Silver Ores.
(Metal Content in Millions of Fine Troy Ounces.)*

Gold.				Silver.			
Country.	1912.	1938.	1950.	Country.	1912.	1938.	1950.
Union of S. Africa	9·11	12·16	11·66	Mexico	74·64	81·02	49·14
Russia	1·07	5·30	— ¹	U.S.A.	63·77	61·71	42·42
Canada	0·61	4·73	4·43	Canada	31·63	22·22	22·42
U.S.A.	4·52	4·27	2·39	Peru	8·35	20·55	13·47
Japan	0·22	1·82	0·13	Australia	13·96	15·55	10·64
Australia	2·32	1·60	0·87	Japan	4·93	10·94	3·68
Mexico	1·19	0·92	0·41	Russia	0·20	7·00	— ⁴
Southern Rhodesia	0·69	0·82	0·51	Germany	4·98	7·00	1·64
Gold Coast	0·35 ²	0·68	0·69	Burma	0·09 ³	6·95	— ⁴
Colombia	0·14	0·52	0·41	Bolivia	4·05	6·37	6·56
World	22·55	37·60	24·20	World	224·31	268·00	171·00

¹ Estimates of the production of gold in Russia differ so widely that they have been omitted from the post-war figures.

² Total for British West Africa.

³ Total for British India.

⁴ Figures not available. An allowance made in world total.

Gold generally occurs either in alluvial deposits (into which it has been washed by the degradation of the rocks from which the deposits are derived) or in quartz-veins in a free state. Often it is associated with various metallic sulphides, chiefly iron and copper pyrites, either in quartz-veins or in other forms in which these ores occur, but it is seldom worth extracting except from quartz-veins. From quartz-veins and other hard rocks gold has to be obtained by stamping or crushing, a process involving more expensive machinery than is used in digging for alluvial gold; but quartz-veins are sometimes capable of being profitably worked to a depth of 2,000 feet or more. The famous 'banket' of the Witwatersrand from which the bulk of the Transvaal gold is obtained is a hard quartz-ore conglomerate of Pre-Cambrian age, in which the gold is so finely disseminated as to be invisible to the naked eye. The bankets are now worked to a depth of over 7,000 feet.

Silver ores generally occur in veins, or irregular deposits. But

with regard to the occurrence of this metal, it is noteworthy that the silver-lead ore sometimes occurs in great quantity in large 'pockets' or cavities in limestone rocks, which are very productive for a time, but are soon exhausted. It is from such chambers that the greater part of the silver of the United States is obtained, and the production of the United States, having first been raised by this fact to an enormous extent, has since fluctuated, with a downward trend. It was after the discovery of the famous Comstock lode in Nevada in 1859 that the United States rose into importance as a silver-producing country. New discoveries have maintained the output and now the leading states are Idaho, Utah, Montana, Arizona, Colorado, and Nevada—all Rocky Mountain States.

Another matter of importance with reference to the production of silver is that a large proportion of the silver of the world is derived from the desilverisation of ores worked for other metals, principally lead and copper. It is by the desilverisation of copper ore (at Mansfeld in the Harz) that a large proportion of the silver of Germany is produced.

LEAD. The consumption of this metal has greatly increased since the beginning of the nineteenth century in consequence of its use for the smaller gas and water pipes, and in various branches of manufacturing industry, as in lining the chambers used in making sulphuric acid. The high position formerly taken by the United Kingdom in the lead industry has been altered by the fact that lead ores are now generally treated in the countries in which they are produced, so that the former large import of lead ores is now replaced by that of pig and sheet lead (chiefly from Australia, Canada, and Mexico). In 1950 the chief producing countries in order of importance were the United States, Mexico, Russia, Australia, and Canada. The value of ores of lead varies greatly.

There are various industries subsidiary to that in lead. The most important of these is the extraction of silver, a small proportion of which is nearly always contained in galena, the chief lead ore, a sulphide of lead. White lead, which is very largely used in making painters' colours and in making the glaze on earthenware, is a carbonate of lead or a compound of lead and carbonic acid. Litharge is a lead oxide or compound of lead and oxygen, and is a yellowish substance used in making the glaze on earthenware and for other purposes. One form of this is called massicot, and from it is made by heating another compound called red lead or minium, which contains a greater proportion of oxygen, and is largely used in the making of flint glass and porcelain, as well as in making red paint.

COPPER. This metal is found in many if not in most countries of the world, sometimes pure (the native copper occasionally forming huge masses), more frequently in the form of ores, which

vary greatly in richness. In 1867 Chile, the northern half of which is intersected in every direction by veins of copper, contributed two-thirds of the entire copper-production of the world; but owing to the discovery of rich deposits of copper in other regions less remote from the great markets of the world, its share of the total copper-production has been greatly reduced. As late as 1880 it still stood first in the list of copper-producing countries, but now the United States has taken the lead, supplying in the years immediately after the Second World War one-third or more of the world production of 2 to 2½m. tons: Chile comes second, though its proportion of the total has declined from 20 to under 15 per cent. (1950). Indeed, the Copper Belt of South Central Africa taken as a whole, on both sides of the frontier between Northern Rhodesia and the Belgian Congo (Katanga District), is now the second largest source of world supply (about one-sixth of the total). Of the combined output, Northern Rhodesia contributes considerably more than Katanga. Canada (about 8 per cent. of the total) and the U.S.S.R. (also estimated to have increased to about 8 per cent.) are the other chief producers. Together these five sources provide about 82 per cent. of the world output of copper.

The production of copper ores from the mines of the United Kingdom is now quite unimportant, but a certain quantity of ore is imported from Canada and there is a large import of copper which has undergone some preliminary treatment. This is converted into pure copper, chiefly at Swansea. It figures in the trade returns as 'Unwrought Copper, including rough copper of 94 per cent. copper content or over', and is divided into 'Electrolytic' and 'Other'. The former and larger class of unwrought copper is supplied by Canada and the United States, Northern Rhodesia and the Belgian Congo, and Chile. 'Other' unwrought copper comes almost entirely from Northern Rhodesia and Chile.

Being an excellent conductor of electricity, copper has had its use greatly extended of later years in making telegraph-wires for underground communication and marine cables. So many industries require copper that it is regarded as a 'key' metal. Apart from the electrical industry the chief uses of copper are in the making of brewers' and distillers' plant, in the making of armament, in ship-building, the making of plates for the printing of textiles, and in the dye industries. Copper is one of the ingredients in the two alloys known as **bronze** and **brass**, the former composed of copper and tin (a very hard compound), and the latter of copper and zinc.

ZINC. This metal was first known in Europe only as an import from China and India, where it had long been employed in the manufacture of brass. The principal ores are zincspar or calamine, a carbonate of zinc, and zinc-blende or sulphide of zinc, both impure, and the methods of treating them were discovered in Europe only

in the eighteenth century. In that continent Belgium, Germany and Poland led the way in actual zinc production from ores before the Second World War; but on the world stage the United States holds an unchallenged position in respect of both supplies of ores and output of zinc. World production of zinc ores, reckoned in terms of their metal content, totals from 1½m. to 2m. tons a year, and to this total the United States contributes between a third and a fourth. The hub of the United States industry is what is known as the Tri-State area (S.E. Kansas, S.W. Missouri and N.E. Oklahoma). Canada's contribution in 1950 was approaching 300,000 tons, and Mexico, Russia and Australia were each credited with over 200,000 tons, out of a total of over 2m. tons. The United States' output of zinc is much greater than the metal content of her own ore production. On the other hand, Canada extracts only about two-thirds of the zinc recoverable from her ore production, and Australia less than half. Mexico, which contributes so largely to the supply of zinc ores, herself produces only 40–50,000 tons of the metal.

TIN. The tin-mines and other deposits of Cornwall and the adjacent parts of Devonshire, which perhaps supplied the Phœnicians with tin three thousand years ago, continued to be almost the sole source of supply of this metal till within the last two hundred years or so. The region just referred to is still the only significant place of production in Europe, but supplies from other parts of the world are now of overwhelming importance. In the years 1938–50 the annual production of tin ore in Great Britain, reckoned in terms of metal, declined from 2,000 tons to less than 900 tons, whereas world production in 1938 was 164,000 tons, and intensified production early in the Second World War brought the total in 1941 up to 241,000 tons. Nearly two-thirds of the world production came from S.E. Asia, Malaya alone supplying over a quarter of the whole, with the Netherlands East Indies (now Indonesia) a good second. There was a big drop in production after the Japanese occupation of S.E. Asia during the later war years, and after the war the difficulty of securing new machinery (dredgers, &c.), coupled with the unrest in the Far East, made recovery a slow progress; but in 1950 world production, exclusive of Russia, was returned as 166,000 tons, or slightly more than in 1938. Malaya contributed a third of the total, and Indonesia one-fifth, and with over 10,000 tons from Siam, S.E. Asia was again providing 60 per cent. of the known world supply.

Among individual countries elsewhere, Bolivia is of outstanding importance. Before the war it made a good third to Malaya and the Netherlands East Indies, with exports of 25,000 tons in 1938; and when supplies from S.E. Asia fell away during the war, Bolivia became the leading country of supply, a position it retained up to 1947, with annual exports of 30–40,000 tons. In 1950, with exports of over 31,000 tons, Bolivia dropped to third place again, though only

just below Indonesia. In Africa, the Belgian Congo and Nigeria are considerable sources of supply, the former averaging about 15,000 tons a year during and immediately after the war (nearly 14,000 tons in 1950), and the latter about 11,000 tons (a little over 8,000 tons in 1950). Australia also produces about 2,000 tons a year.

To a large extent Malaya, Indonesia, and the Belgian Congo have developed their own smelting industries, but much of the world supply of tin is extracted in the United Kingdom and the United States, both of which import large quantities of ore for the purpose. The United States' own production of ore is negligible, and it has only come to the front in smelter production of tin as a result of the Second World War.

Tin ore is met with either in veins (or lodes) in the rock, or in alluvial deposits. The former is called mine-tin, the latter stream-tin. The stream-tin, being generally near the surface, is naturally the easier to obtain where it is abundant; and it is the abundance of such deposits in Malaya that makes that part of the world such an important source of supply at the present day. Most of the tin ore of the world is the oxide, cassiterite, which being both heavy and stable, tends to be found concentrated at the base of gravel and can easily be separated by washing from the lighter constituents. Tin is mostly imported in the metallic state or as a concentrate for further refinement. It is largely used to cover sheets of iron or steel with a coating as a protection against rust, and thus to form tin-plates, or, alloyed with lead, to form terne-plates.

MERCURY or QUICKSILVER, the only metal fluid at ordinary temperatures, has long been principally obtained in Europe from the Spanish mines of Almaden in the Sierra Morena, which were worked even under the Romans. In 1942, at the height of the Second World War, Spain supplied 75 per cent. of the mercury imported into the United Kingdom, and in the following year 100 per cent. Other sources of supply include the Amiata mines in Tuscany (Italy), and the Idria mines in Carniola (formerly part of Austria-Hungary; in the possession of Italy between the two World Wars; now held by Yugoslavia). While Italy had the Idria mines, her production of mercury marched with that of Spain, and even without them she has, since the war, more than kept pace with the development of Spanish supplies; in 1950 Italy's production of mercury was a little over 4m. lb., and Spain's a little under. Since the middle of last century, when the New Almaden mines were opened in California (Santa Clara co.) and were followed by the New Idria mines (San Benito co.), large quantities of mercury have been produced in the United States, and at the close of the Second World War her production vied with that of Spain and Italy, as also did Mexico's, each of these four countries having an output in 1944 of between 2 and 3m. lb. But since the war, production both in the United States and in Mexico has dwindled to

some 300,000 lb. (1950). Canada also, having large supplies which she developed as a war measure, has since then practically ceased production.

The uses of mercury are various. In its pure state it is chiefly employed in the making of scientific instruments. Combined with other metals, it forms what are called amalgams, which are soft and easily fusible. An amalgam of mercury and tin was once largely used in the silvering of mirrors, but is now generally replaced by electro-deposits of silver. In mining for silver and gold these metals are frequently extracted by employing mercury to form amalgams with them, and the large amount of mercury required for this purpose in the extensive silver-mines of California and Nevada, near the chief seat of the United States production of quicksilver, is one great cause of the extensive demand in the United States for the latter metal.

IRON. The uses of iron are too numerous to specify, and for the most part too familiar to need specifying. No other metal can fully supply its place. No other metal is produced in such abundance or over so large an area of the world. At the present day, indeed, none but the most backward tribes in a few out-of-the-way islands and corners are unacquainted with its working. Its use in the past goes back to a remote antiquity—how remote it is impossible to say. The iron implement brought to light in 1837 by Mr. J. R. Hill walled up in one side of the Great Pyramid of Gizeh carries us back about 5,000 years. The explanation of the rarity of the remains of ancient iron implements as compared with those of bronze is to be found in the fact that under the influence of air and moisture iron is eaten away so rapidly that its preservation for a long period is possible only under very exceptional conditions. So liable is it to disappear that, of all the numerous articles of iron that must have existed in ancient Egypt, the remnants that have been discovered do not weigh in all more than a few pounds, and this in a country with a dry climate specially suited to the preservation of such articles.

The discoverers of the New World stated that the inhabitants of the parts at which they first touched, the West Indies and Darien, were unacquainted with iron, and their statements have frequently been made to apply to the whole of America, including the civilised empires of Mexico and Peru. But against this idea there is the express testimony of several contemporaries of the first explorers—testimony from which it appears that the working of iron was practised before the arrival of the Spaniards in various parts of the American continent, and there is evidence of other kinds to show that it must have been so in other parts regarding which we have no direct statements on this head.

But ancient and widespread as the iron industry is, its rapid growth in modern times, and in particular since the close of the eighteenth century, is an astonishing fact, or would be so if we did

not bear in mind the other great developments in industry and commerce within that period. In 1740 the whole production of iron in England is estimated to have been only about 18,000 tons; even in 1796, after the introduction of spinning machinery, only 125,000 tons. The enormous growth since then—it reached 10m. tons in Britain alone in 1913—is the result of the vast demand for this material which has arisen from its use in machinery, railways, shipbuilding, and the making of bridges and other structures. Iron is, in fact, the second of the two great material factors concerned in maintaining modern industry and commerce on a large scale, coal being the other. The history of iron in many of its details is of singular interest, not only as showing how the volume of iron production has been raised to its present pitch, but also because some of the facts in that history have had an important effect on the geographical distribution of the industry.

Iron, like so many other metals, is not found native in nature but has to be extracted from ores, which vary greatly in their richness and the nature of the other substances with which the iron is combined. The ores have to be smelted or reduced to a metallic condition by heat and chemical action, and most of the iron then sinks to the bottom of the furnace and is run off into moulds. This is what is called **pig-iron** or **cast-iron**, and is never pure. It always contains a considerable proportion of carbon, of which pure charcoal is one of the forms; sometimes it contains substances much more injurious to its quality, the most prejudicial being **sulphur** and **phosphorus**. Even the carbon is injurious to some extent, and renders cast-iron brittle and unfit for use in the making of anything which has to stand a severe strain. It is for this reason that, by driving out almost all the carbon, cast-iron is converted into wrought or malleable iron, which does not harden greatly when cooled suddenly. This is usually effected by a process called puddling, which consists in remelting the cast-iron on the hearth of a furnace, and stirring it about when molten with a rake, which causes the carbon to escape and get burnt up in the intensely heated air of the furnace. As the carbon escapes the fluid becomes pasty, and the iron is then brought away in large lumps, and afterwards hammered into rude slabs called blooms, and rolled out to form bars, sheets, &c. In this form of iron there remains an admixture of slag or 'cinder.' The process of driving out the carbon was greatly quickened by the invention in 1784 of the reverberatory furnace, in which the charge of iron is placed in a separate chamber from the fuel and thus protected from the carburising action due to the combustion. This invention was due to Henry Cort in England, who in the previous year had introduced grooved rollers in rolling-mills for the production of bars of definite shapes.

The material so formed is very tenacious and tolerably hard,

but for some purposes not sufficiently hard. For the making of most machinery, weapons, and cutlery of all sorts, a kind of iron is required which, besides being very tenacious, must also be flexible, elastic, and very hard; and for these and other purposes iron is converted into **steel**, which is nothing else than a form of iron containing a small proportion of carbon. The term steel is now confined to products which contain between 0·3 and 2·2 per cent. carbon, that is, enough to make them harden greatly when cooled suddenly, but not enough to prevent them from being usefully malleable at some temperature. The name of weld-steel is given to all varieties of iron made by the old puddling process above described, but containing carbon within the limits stated as well as an admixture of slag. The best steel, however, is free from slag.

The history of the iron industry consists in a gradual series of improvements in the methods by which all these processes are carried on. Only a few of the great steps in advance can here be mentioned. In many cases, the most important improvements, associated with the names of certain inventors, are only slight modifications of methods which in the course of the gradual development of this industry had been previously suggested; modifications, however, which were just what was needed to make the methods practically useful.

In ancient times, when the methods of working iron were very defective, good iron could be made only from the best ores, and hence districts containing ores of fine quality had the principal trade in iron. During the early history of Greece certain tribes inhabiting the northern slopes of the tableland of Asia Minor, to the west of Trebizond, among others the Chalybes, seem to have carried on a large trade in iron for this reason, and from them the Greeks derived their word *Chalups* for hard iron or steel. To the Romans were known many deposits of iron ore, including the rich ores of Bilbao, in the north of Spain. Remains of Roman ironworks are found in various parts of Great Britain, but so imperfect were their methods of smelting, so small a proportion of the iron was obtained from the ore, that the slag or refuse material from the smelting furnaces of the Forest of Dean, in Gloucestershire, supplied at a later period the only ore required for the furnaces of that region for a period of between two and three hundred years. At the same time these old Roman methods were very expensive.

Down to a comparatively recent date one reason of the limited and costly production of iron was that wood or charcoal was the only fuel used in smelting; and this fact had an important effect both on the geographical distribution of the iron industry, and on the aspect of those regions in which that industry was long pursued. Iron could be smelted only in the neighbourhood of forests, and in process of time forests were cleared in feeding the furnaces. The forest from which the Weald takes its name perished in supplying fuel to

the iron-furnaces of Kent and Sussex, the last of which was blown out early in the nineteenth century. An English parliamentary report of the year 1719 makes strong complaint of the devastations wrought by the ironworks in the counties of Warwick, Stafford, Worcester, Hereford, Monmouth, Gloucester, and Salop. About twenty years later the English import of foreign iron was computed at about 20,000 tons annually—ten per cent. more than the home production. The greater abundance of wood in Germany as compared with England was one important reason why the iron industry of the former country was greater than that of the latter even as late as the earlier part of the eighteenth century.

Coal was first used with practical success in the smelting of iron by Dud Dudley (son of Lord Dudley) in 1619, but the practice was then followed only by himself, and the knowledge of it died with him. The use of coal in the form of coke was introduced by the Darbys of Coalbrookdale early in the eighteenth century, but the process was kept a secret by them, and it was not till after the middle of that century that it became generally known. Some coals, such as the splint coal of the Glasgow district, are capable of being used in the blast-furnace even without being made into coke. Though a great economy is effected by the use of coke or coal, yet even in the improved furnaces of the present day, such fuel does not make so pure an iron as charcoal, inasmuch as it usually contains sulphur and other ingredients more or less noxious. In Sweden, a country rich in forests, charcoal is still used in some iron smelting-works, and to this fact the high quality of Swedish iron is partly due.

Besides coke or other fuel, it is necessary in the case of most kinds of iron ore to put into the smelting- or blast-furnace along with the ore a certain quantity of a material intended to facilitate the reduction. The material so employed, called a flux, is generally limestone or lime; and consequently facilities for obtaining this mineral form an important geographical factor affecting the prosperity of the iron industry in different places. For some kinds of ore, as for that called red hematite, which contains 55–70 per cent. of iron, this is not always required. Most kinds of ore, too, require to be roasted previously to being put in the blast-furnace—an operation performed in kilns or formerly by laying out the ore in a heap mixed with coal in the open air and setting fire to the heap at the end from which the prevailing wind blew. In the case of blackband iron ore, there is generally enough matter of the nature of coal in the ore to render the addition of coal unnecessary in roasting. The effect of the roasting is to reduce the bulk of the ore which has to be put into the blast-furnace, and at the same time to remove by burning most of the sulphur and other substances that can be volatilised. For red hematite this operation is considered unnecessary.

After the introduction of coal and coke in smelting, the next great step in the economising of fuel was due to the invention of the hot-blast, that is, the practice of raising the air used in blowing the smelting-furnaces to a high temperature before introducing it into the furnace. This invention, due to Mr. Neilson of Glasgow, was first applied in 1828. In 1832 more saving was effected (first in Germany) by using the waste gases of the furnace to heat the blast. About 1870, in the best-constructed furnaces the blast had a temperature of only about 800° F., but afterwards it was sometimes raised to as high as 1,650° F. Such high temperatures were, however, found to be rapidly destructive to 'pipe-stoves' of the old type, and these are consequently now superseded by a new type of furnace in which the blast is usually maintained between 900° and 1,200°, occasionally at as much as 1,400° F. Blast furnaces have also been enlarged and improved in construction. In 1880 an out-turn of 115 tons of iron per day was exceptionally large; now the normal output of an average furnace is up to 500 tons a day. Once a modern blast-furnace is shut down it takes two months to restart it, or, if a new lining and hearth are required, about four months. The waste gas which used to be seen burning at the top of the furnaces is now utilised to heat the boilers of the engine employed to work the blast and the hot-air stoves—an idea which originated in France in 1814, though it has been applied in a sufficiently simple manner only since about 1850 (first in South Wales). By all these means the consumption of coal has been so greatly reduced that, whereas in 1796 six tons of coal were required to produce one ton of iron, two tons of coal ($1\frac{1}{2}$ of coke) now suffice for that production. A further great economy in the iron industry has been made where the iron is worked up in the same establishments in which it is extracted from the ore. The gas of the blast-furnaces is then employed also to drive the rolling-mills and other engines, and the heat of the molten cast-iron is not lost till the iron is delivered as rails or in some other form. Recently iron ores have also been smelted by electricity. It is important to distinguish between electric iron and electric steel furnaces. Electric iron furnaces are used in countries which have abundant water power but little coking coal, as Norway, Sweden and Switzerland. In Britain and the United States pig-iron is made only in blast furnaces. Electric furnaces are largely used in making ferro-alloys, but their main function is the production of specialised steels. Both in Britain and in the United States roughly 5 per cent. of the total output of steel comes from electric furnaces.

Further great developments of the iron industry have been due to the inventions which have done so much to cheapen the production and extend the use of steel as compared with wrought iron. The old method of making steel by the process called cementation is still the best, and indeed the only method by which steel of the quality required for making good cutlery can be manufactured.

This method consists in sealing up bars of wrought iron in fireclay troughs along with a quantity of charcoal, in which the iron bars are embedded, each separated by a layer of charcoal from the others, and exposing them thus to a high temperature for a week or ten days, according to the quality of steel required. At the end of the period the iron is found to have combined with the requisite amount of carbon, but to have become porous and rough on the surface, on which account it is known as blistered steel. This, after being condensed by hammering and rolling, and fused in crucibles to get rid of all traces of slag or cinder, forms the finest kind of cast steel. The hardest steel thus made has about 1.2 per cent. of carbon. The process, from its nature, is obviously a costly one.

There are now many methods of producing **cast-steel** on a large scale, and three of these are sufficiently widely practised to have a geographical interest. The first of these, introduced before 1860, is that which is associated with the name of Sir Henry Bessemer, being employed in the production of what is called Bessemer steel, although the method as now practised in most of the great iron-countries involves an important improvement introduced by Mr. Mushet. By the Bessemer process molten pig-iron is poured into a vessel known as a converter lined with a highly refractory material, usually ganister, so arranged that cold air can be blown through the molten mass, burning away both the carbon and the silicon entirely. The due proportion of carbon is afterwards added and mixed with the fused metal by a repetition of the blowing. As originally devised, this process was found to be unsatisfactory except in the case of a few ores. The resulting product was very brittle, and Mr. Mushet's improvement consisted in adding the carbon in a compound containing manganese, which serves to correct the fault to which this brittleness is due. The compounds employed are spiegeleisen and ferro-manganese, which are made from certain iron ores rich in manganese, such as are found in Spain, the Siegerland district in Germany, Greece, Sweden, and elsewhere. When the ore used in making the pig-iron put into the converter itself contains a sufficient amount of manganese, the use of spiegeleisen or ferro-manganese is not necessary. The amount of iron that may be converted into steel in a single converter at one time by this process varies according to the capacity of the converter. A common size is the 12-15-ton Bessemer converter.

Another process, known as the Siemens-Martin or open-hearth process, differs from the Bessemer process only in that the operations are performed in a different kind of furnace, in which the air employed to remove the carbon plays over the molten metal instead of being blown through it. Some such furnaces even as early as 1902 had a capacity of as much as 100 tons. A common capacity is 50 to 80 tons.

Even with the improvement of Mushet these two processes

are not applicable to all kinds of pig-iron. Neither of them removes phosphorus if the pig-iron happens to contain it. Now steel is rendered brittle by even a very slight proportion of this ingredient. In the best tool steel it is considered that the proportion of phosphorus should not exceed one part in five thousand, in bridge steel one in two thousand, and in rail steel one in one thousand, and with the increasing weight and speed of trains railway engineers became more exacting in this respect. The processes for making steel and ingot iron on a large scale can accordingly be applied in their original form only to iron made from ores in which phosphorus is not contained, or is present only in very small amount indeed. Such ores are known comprehensively as Bessemer ores. In the Old World, the only ore from which iron of this quality can be made in large quantity is the hematite, which occurs in the north-west of England, in northern and southern Spain, in Greece, Sweden, Algeria, and on the island of Elba. So long, therefore, as no process was known for making cast steel on a large scale so as to overcome the above-mentioned drawback, the geographical distribution of these ores was obviously greatly in favour of the English iron and steel industry, for not only did England herself possess stores of the valuable ore in the most convenient situation, but ores from Italy, Spain, and Algeria could be landed after a sea-voyage close beside the blast-furnaces of Newport and Middlesbrough, whereas on the continent a railway journey, or at least a transshipment to river or canal boats, was in most cases necessary to bring them to the districts where the iron industry is pursued.

It was accordingly a discovery of the highest importance for the future distribution of the iron and steel industry when a method was devised by which phosphorus could be removed from the pig-iron in the process of converting it into steel. A practicable method of doing this was invented by Mr. Thomas and Mr. Gilchrist of Middlesbrough, in association with others. The method consists in using for the lining of an ordinary Bessemer converter a composition which, while serving the other purposes of the lining, has such a chemical action as to remove any phosphorus that may be present in the iron poured into the converter. Lime is mixed with the lining to serve as what chemists call a 'base,' with which the phosphorus, quitting the iron, may combine; and the process is hence known as the basic process. If the proportion of phosphorus be too great to be removed by that means alone, additional lime is added in some form in the converter along with the metal. This process was first practically applied in 1879, and besides making the ores extracted round Middlesbrough (the Cleveland ores) for the first time available for the manufacture of mild steel or ingot iron, has enabled the mainland of Europe to compete with the United Kingdom in the iron industry more keenly than hitherto.

The basic process was first applied in the United States in 1890, but has since then made rapid progress. In the United Kingdom it is not so largely adopted as it now is both on the continent and in the United States, the reason probably being that it is not so conveniently applied to the open-hearth as to the Bessemer method of making steel, and open-hearth plates are those which are preferred by shipbuilders, to whom is due a large demand for British steel. Later processes have, however, been devised for facilitating the manufacture of basic steel by the open-hearth method.

In recent years various compounds of steel with other metals have been made for special purposes, increasingly with the use of the electric furnace. One of these is **nickel-steel**, which contains from 3 to 3·5 per cent. of nickel, and about 0·25 per cent. of carbon, and is much tougher and stronger than ordinary steel, and yet extremely ductile. The combination of properties causes nickel-steel to be used as material for the armour plates of war-vessels—at least when the outer surface is hardened by some carburizing process, followed by sudden cooling. **Manganese steel**, which contains from 12 to 14 per cent. of manganese and 1·5 per cent. of carbon, has extraordinary tenacity, but appears to be too expensive a product for ordinary use. This largely arises from its extreme and irreducible hardness, which necessitates it being cut by special instead of the ordinary tools. **Chrome steel** contains about 2 per cent. of chromium and 0·8 per cent. of carbon. When suddenly cooled it is not only extremely hard but highly elastic, which makes it peculiarly suitable for use in the making of armour-piercing projectiles. It is also proof against the burglar's drill. **Stainless steel**, which is used for making cutlery as well as a great variety of other articles liable to be exposed to contact with water in any form, contains about 13 per cent. of chromium and other metals, according to the special type. What is known as **high-speed steel** is an alloy containing in its best varieties between 5 and 6 per cent. of chromium and about 18 per cent. of tungsten, with less than 1 per cent. carbon. It remains hard at a temperature of even 750° F., and is hence well suited for the manufacture of turning lathes used in cutting thick slices, a process in which the great friction develops very high temperatures. Where lightness as well as great hardness and power of resisting shock is important, as in the steel used in some parts of automobiles, a small quantity of vanadium is now frequently combined with chromium. Steel containing both nickel and chromium is regarded as essential in the making of aeroplanes.

From the nature of the **iron industry** as now pursued it follows that it is most largely developed in those countries which stand first in commerce and manufacturing industry generally. The consumption of iron and steel is relatively high in two regions: first, one in

which there are vast movements of produce, as in new and sparsely peopled countries in which iron and steel enter largely into use in connection with the transport and handling of grain, &c.; and, second, one in which raw materials are subjected on a great scale to changes of form. It is in the latter, that is, in the manufacturing countries, that the demand is greatest in the aggregate, and some of the most important products of the industry required in the thinly peopled regions, such as rails, rods, sheets, structural forms, wire, &c., can be transported in a finished form or a form that involves little or no waste in their ultimate use. The following tables show the production of iron ore, pig-iron, and steel in various countries over a period of years.

Production of Iron Ore (in million tons).

Country.	1913.	1921.	1929.	1932.	1938.	1946.	1950.
United States .	61·98	29·56	73·03	9·85	28·45	70·84	98·16
U.S.S.R. .	— ¹	0·13	7·72	12·00	26·11	22·00	44·00
France .	21·56	13·89	49·92	27·21	32·61	15·76	29·50
United Kingdom	16·00	3·48	13·22	7·33	11·86	12·17	12·94
Sweden .	7·35	6·36	11·28	3·25	13·71	6·76	13·39
West Germany .	28·15 ²	5·80	6·27	1·32	10·97	4·04	11·03
Six leading countries .	135·04	59·22	161·44	60·96	123·71	131·57	209·02
World Total .	—	72·00	200·00	75·80	165·90	152·34	245·07

¹ Not available.

² Including Lorraine.

The United Kingdom led the world in the production of iron ore till near the end of the nineteenth century; then it began to be outstripped by the United States in 1889 and later by Germany and France. Production in the United States, though subject to violent fluctuations, has gone up by leaps and bounds, and during and since the Second World War it has reached peak figures of over 100m. tons. Though exact information is lacking, Russia is known to have gone rapidly ahead; on a smaller scale Sweden has also markedly increased her output, and France and West Germany have both made good recoveries; but the United Kingdom has done little more than mark time, and has never regained the production she enjoyed before the First World War.

As shown by the next table, the production of pig-iron has also fluctuated considerably in the leading countries, but throughout the years covered by the table the United States has easily held the lead. Germany, normally second, has twice suffered setback through her defeat in World Wars. Russia's output is difficult to assess but, as estimated, she led all but the United States after the Second World War. Lower in the scale, the United Kingdom and France have alternated in leading one another. The table of steel production tells

much the same story; but in this case the United Kingdom makes a better showing, and is well ahead of France.

Country.	Average annual production of pig-iron in millions of tons.					Percentage of total of six countries.				
	1911-13	1927-29 ¹	1932	1936-38	1950	1911-13	1927-29	1932	1936-38	1950
U. Kingdom .	9.7	7.2	3.6	7.7	9.6	14.7	9.6	11.3	10.0	8.8
United States .	28.1	39.1	8.8	29.1	59.3	42.5	52.0	27.6	37.7	54.4
Germany .	17.3	12.7	3.9	16.2	9.6	26.2	17.0	12.2	21.0	8.8
France .	4.8	9.0 ¹	6.8 ¹	6.6	7.6	7.3	11.9	21.3	8.5	7.0
Russia .	4.0	3.4	6.1	14.5	19.2	6.0	4.5	19.1	18.8	17.7
Belgium .	2.2	3.8	2.7	3.1	3.6	3.3	5.0	8.5	4.0	3.3
Six leading countries .	66.1	75.2	31.9	77.2	108.9	100.0	100.0	100.0	100.0	100.0
World Total .	71.0	89.9	38.9	91.46	130.6					

¹ Including Saar production (between 1m. and 2m. tons).

Production of Steel Ingots and Castings (in million tons).

Country.	1913.	1930.	1932.	1938.	1944.	1946.	1950.
United States .	31.3	40.7	13.7	28.3	80.0	59.5	86.5
Germany .	17.3	11.2	5.5	22.3	18.0	2.7	13.1 ²
United Kingdom	7.7	7.3	5.3	10.4	12.1	12.7	16.3
France .	4.6	11.2 ¹	7.0 ¹	6.0	3.0	4.3	8.5
Belgium .	2.4	3.3	2.7	2.2	0.6	2.3	3.7
Russia .	—	5.7	5.8	17.5	—	11.8	24.6
Six leading countries .	63.3	79.4	40.0	86.7	113.7	93.3	152.7
World Total .	75.4	93.4	49.7	107.6	148.0	107.7	183.0

¹ Including Saar production (between 1m. and 2m. tons).

² Over 90 per cent. in Western Germany.

The countries listed in the foregoing tables account for between 80 and 90 per cent. of world production. Several other countries are producers of iron and steel on a considerable, though smaller, scale. Japan's output of pig-iron in 1938 was 2.5m. tons, and in 1942 it rose to 4.4m. tons; after her defeat in the Second World War, it dropped to under a quarter of a million tons in 1946, but by 1950 it was again between 2 and 3m. tons. Australia and India each produced between 1 and 2m. tons in 1950, while Canada's output exceeded 2m. tons, as did that of Luxembourg and Czechoslovakia. There is a corresponding production of steel in most of these countries. In 1950, Canada produced 3m. tons, Czechoslovakia, Luxembourg, Poland, and Italy between 2 and 3m. tons each, and Sweden, India and Australia over a million tons each. Relatively to population Sweden has a large iron industry, due to the great abundance as well as the excellent quality of its ores, the plentiful supply of charcoal fuel for smelting and, latterly, the development of hydro-electric power.

On page 329 a map of Britain shows the chief centres of iron ore

production. The indications of relative importance on this map are based on values, not quantities, seeing that a ton of iron ore means in different cases very different things, in consequence of differences in richness and freedom from noxious impurities. Such maps do not indicate all the advantages of situation. In Germany, the iron industry was greatly stimulated by the improvement in the Rhine navigation which was carried out towards the close of the nineteenth century.

In the United States the greatest production is far from any coal-fields; but this is compensated by the mode in which the deposits occur. They lie in enormous quantities, capable of being quarried with exceptional ease, and of being handled and transported both by water and rail at an exceedingly low cost. On the lakes the ore is carried in large vessels, some of more than 12,000 tons, which, on reaching the lake-port for which they are bound, may have their entire cargo carried in six or seven trains of 50-ton steel railway wagons to a great iron- and steel-working centre like Pittsburgh; whence return cargoes of coal can always be obtained in consequence of the abundance of coal at that centre and its deficiency in the region round the lakes.

But, further, we have to consider the market. In this case the development of the industry was greatly assisted in Germany and the United States (as well as other countries) by protective tariffs securing so far as possible the home market. With regard to that point all that the geographer has to note is the extent and importance of the market so secured, and it is a vital consideration that within its own borders the United States offers the largest (the wealthiest, though not the most populous) free-trade market in the world for the products of this as of most other industries, and that pre-1913 Germany (the German Customs Union) was one of the largest on the mainland of Europe. But apart from that it is important to remember that the great markets for iron and steel products are the most advanced industrial countries generally—for the most part so situated that they can be reached from inland centres of production in Europe and North America without break of bulk.

These industries demand the highest organising capacity and great supplies of skilled labour of all kinds, and hence are of such a nature as to be much more difficult to establish in small local markets than the textile industries. This is particularly true of some of the more complicated branches of the iron industry. And hence in the more advanced industrial countries we find a rapid expansion of the machine industries compensating in some measure a less rapid advance of those connected with textiles. This is illustrated by the high place still occupied by machinery amongst British exports as shown in the tables in the section on Britain. Yet under this head also we can see the operation of decentralising tendencies.

Though our rivals were fewer in number in this than in the textile industries, still for many years before the Second World War the exports of machinery from the United States and Germany had been growing more rapidly than our own.

The very rapid increase in the consumption of iron in recent years has frequently excited apprehensions as to the possible exhaustion of the supply. These apprehensions led to an inquiry being made into the subject at the instance of a committee appointed by the Eleventh International Geological Congress held at Stockholm in 1910. The results given in the summary of the returns by Professor Hjalmar Sjögren are admittedly to be regarded as only very rough estimates, but they are here reproduced for what they are worth. The reserves are classed as actual and potential, according as they refer to areas then actually worked, or areas containing ores that might become available through the extension of the means of communication and the improvement of our technical knowledge.

—	Actual reserves. Millions of tons.		Potential reserves. Millions of tons.	
	Ore.	Iron Content.	Ore.	Iron Content.
Europe . .	12,032	4,733	41,029	12,085 + Considerable
America . .	9,855	5,154	81,822	40,731 + Enormous
Australia . .	136	74	69	37 + Considerable
Asia . .	260	156	457	283 + Enormous
Africa . .	125	75	Many thousand	Many thousand
	22,408	10,192	>123,377	>53,136 + Enormous

As the present annual production of pig-iron is well over 100m. tons, and that of steel approaches 200m. tons, it thus appears that the 'actual' reserves would not suffice for half a century, even if there were no further increase in the annual production. Of the known deposits of ore containing 60 per cent. of iron or more, by far the most extensive are those of northern Sweden, estimated to amount to 1,035 millions of metric tons, containing 673m. tons of iron. Next come the deposits of Krivoi Rog, estimated at 86m. tons, with 53.5m. tons of iron. The total quantity of such ores classified as 'actual reserves' is only 1,300m. tons, in addition to which there are estimated to be 687m. of 'potential reserves'.¹ But since the date of this survey vast new deposits have been located in many parts of the world, e.g. in Russia, South America, and Africa.

SALT. This product, so universally used and so widely distributed, is more an article of local production in almost all countries than an article of international commerce. It is obtained both from

¹ *The Iron Resources of the World*, vol. i., p. xxi.

deposits on the land (rock-salt and brine pits) and by the evaporation of sea-water. In the production of salt the United States, Germany, Russia, the United Kingdom, China, France, India, and Italy are the leading countries (over a million tons in a year). The United Kingdom has by far the largest consumption of salt per head, which is in a great measure due to the use of this mineral in the arts. The chief salt-exporting countries are China, Egypt, Aden, the United Kingdom, Italy, Russia and Formosa. Portugal is noted for the excellence of its bay-salt. In tropical countries with an excess of rain there is apt to be a deficiency of salt, and hence India imports (largely from Aden and Egypt) up to 250,000 tons and more annually.

MINOR MINERALS

Antimony, employed to give hardness to softer metals in various alloys, more particularly in the making of type-metal, bell-metal, and Britannia metal; also used for making antimonial lead for storage batteries and for pigments; produced in America and Great Britain from ores obtained principally from Bolivia and Mexico.

Manganese, an indispensable constituent of certain compounds of great importance in the making of steel. One of its ores, known as the black oxide of manganese or pyrolusite, is also largely used in the manufacture of bleaching-powder, and as a decoloriser in glass-making. The post-war annual production of manganese ore rose steadily to 6-7m. tons in 1950, Russia being credited with nearly half, and the other chief producing countries being the Gold Coast, India, and South Africa, followed at a considerable distance by French Morocco, Brazil, Japan, and Egypt. The ore is largely exported by these other countries, and very largely imported by the United States; the United Kingdom also is a large importer. A manganese ore suitable for the making of ferro-manganese is found in Merioneth and elsewhere in Great Britain, but peacetime production is negligible. In the United States considerable supplies of manganese ores are worked, chiefly in Minnesota, Montana, and New Mexico. The metal manganese is used in various alloys. With copper it produces a very tenacious kind of bronze; with copper and zinc, sometimes with the addition of a little iron and nickel, a substance resembling nickel.

Chromium, a metal occurring in nature chiefly in the form of chromate of iron or chrome iron ore, which is used not only in steel-making but in the manufacture of bichromate of potash, from which various pigments are derived. Chromium plating has largely replaced nickel plating as it gives a bright metallic surface, which is stainless and does not tarnish. The ore is produced most largely

in South Africa, Southern Rhodesia, Turkey, the Philippines and—on the basis of her planned production—Russia. Chromium-cobalt alloys, sometimes with the addition of tungsten or molybdenum, are used under the name of stellite in the making of high-speed cutting tools containing no iron.

Arsenic is another metal chiefly used, not by itself but in its compounds, which are largely manufactured in the United States, Germany, England, and elsewhere for use in medicine, in the manufacture of weed-killers and insecticides, and in the preparation of green pigments.

Bismuth, chiefly used to give increased fusibility to various metallic alloys, and in the manufacture of certain colouring matters. The ore is produced mainly in Peru, Mexico, Canada and Spain.

Platinum, a rare metal, but indispensable in the chemical arts on account of its resistance to heat and acids, which renders it the best material for making crucibles and vessels required for certain purposes. It is obtained in Canada, the Ural region of Russia, South Africa, the United States and Colombia.

Nickel, sometimes used, among other purposes, for coining; formerly produced mainly in Germany, now mostly in Ontario (three-quarters of the world's supply is obtained in the Sudbury district), Russia and New Caledonia. The metal is used in steel-making and in plating. Monel is an alloy of nickel (nearly 70 per cent.), copper, iron, and manganese, strong and easily machined and little liable to corrosion: so called after its inventor.

Cobalt, in one of its forms found associated with nickel, is most largely produced in the Belgian Congo and Northern Rhodesia. Its principal use in the arts is in the form of the oxide, which is used as a blue colouring-matter for pottery and glass; smalt, which is finely ground glass coloured with this oxide, is used in colouring paper, &c.

Aluminium is a metal valuable for its lightness, bright colour, its resistance to the action of air even in the presence of moisture, and the excellence of its alloys, especially aluminium-magnesium (Duralumin). Aluminium is now sometimes used for the transmission of electrical currents, giving nearly twice the carrying power of copper. The metal is made from two compounds found in nature—cryolite, obtained from the west coast of Greenland; and bauxite, of which large quantities are mined in many countries, chiefly the United States, British and Dutch Guiana, France and Hungary. Aluminium is an essential component of aircraft, and the world production of 3.9m. tons of bauxite in 1938 increased during the Second World War to 13.4m. tons in 1943, the United States alone producing 6.2m., British Guiana 1.9m., Dutch Guiana 1.6m. and France and Hungary each nearly 1m. tons. In 1945 world production was back at the 1938 level, but in 1950 it amounted to 8.3m. tons, the chief producers

being Dutch Guiana (2m. tons), British Guiana (1·6m. tons) and the United States (1·3m.). The metal is extracted by means of an electric furnace. Both bauxite and cryolite are used; the bauxite (hydrated alumina) is the raw material and the cryolite (sometimes made artificially) is used in a molten state to dissolve it. In its dissolved state the bauxite is easily decomposed by the electric current. The cryolite is used over and over again. Very high temperature being required, aluminium factories are usually erected where much water-power is available, as at Niagara Falls, on the Saguenay River in Canada, in Norway, at L'Argentière in south-east France, at Rheinfelden in Switzerland, and at Kinlochleven on the borders of Argyllshire and Inverness-shire. A project to double the Canadian production (already approaching half-a-million tons) is being carried out in British Columbia.

Tungsten or Wolfram, which has considerable importance from its being used in the production of high-speed steel, was mined in Cornwall, but is now obtained mainly in China, Korea, the United States, Bolivia, and Portugal.

Sulphur, used in making sulphuric acid, in vulcanising and as a remedy for certain vine diseases. It is exported as native sulphur chiefly from the United States, also from Sicily and Norway; and, as a constituent of iron and cupreous pyrites, chiefly from Spain, Portugal, Cyprus, and Norway. The great bulk of the world production of native sulphur comes from the United States (chiefly Texas; balance from Louisiana). The United States also has a large though not a preponderating production of sulphur derived from pyrites (chiefly Tennessee).

Mineral Manures. Among these the most important are: (a) **Potash** (p. 307). Germany and France are chief contributors, and the United States and Spain important secondary contributors, to a world production in 1950 of about 18m. tons, of which the K_2O content or its equivalent amounted to between 4 and 5m. tons. (b) **Nitrate of soda**, used both as a manure and in the arts. Practically the entire supply of natural nitrates ($1\frac{1}{2}$ – $1\frac{3}{4}$ m. tons) comes from northern Chile, in the form of nitrate of soda. At the time of the First World War this Chilean natural product constituted the bulk of the world's supply of nitrogen compounds, but it is now only a fraction of the total, owing to the increase of manufactured nitrogen compounds, amounting to upwards of 12m. tons, which are widely used as artificial fertilisers, including those produced by hydro-electric power in Norway and elsewhere by the fixation of atmospheric nitrogen. (c) **Phosphate of lime**, produced from phosphate-rock, found most abundantly in the United States (especially in Florida and central Tennessee); in Morocco, Algeria and Tunisia; in Russia; and in various islands in the Pacific and Indian Oceans, notably Nauru, Ocean, and Christmas Islands. (d) **Guano**, consisting

of the droppings of birds accumulated through ages in regions where there is little or no rain to wash away the deposits. It is worked as a mineral, and may be described as an earthy nitrate or combined nitrate and phosphate rock—a sub-division of group (c). It is not always easy to determine the precise character; the classification of the island deposits mentioned under (c) has been the subject of a good deal of controversy. The classic example of guano deposits on a large scale is their occurrence in the Lobos Islands, off the coast of Peru. (e) **Basic slag.**

Borax, a compound of boracic acid and soda, found in many parts of the world with a very dry climate, such as the states of California and Nevada in the United States, the western strip of Peru and Chile, Tibet and Asia Minor, and also manufactured from boracic acid obtained by concentration from springs in the south of Tuscany. It has very varied uses in the arts. Among the most important are its employment in the making of enamel and glazes for pottery, and in the making of certain kinds of glass, the borax serving to some extent as a substitute for silica.

Nitrate of potash (Saltpetre). See pp. 304, 307.

Graphite or plumbago, popularly known as 'black lead,' a substance familiar from its domestic uses and its use in the making of lead pencils, but also very largely employed in making crucibles and type-metal and for other purposes. Formerly the best kind was obtained from Borrowdale in Cumberland, but Mexico, Ceylon, Madagascar, Japan, and Korea are now the chief sources of supply. In Europe it is produced in Germany, Austria, Czechoslovakia, and Italy. Considerable quantities are also produced in Canada and the United States.

Lithographic stone is known to occur in various places, but the best stones are all obtained from the quarries of Solenhofen in the neighbourhood of Donauwörth in Bavaria.

Grinding and polishing substances. (a) **Buhrstones** are the stones used in the old kind of corn-mills, now to a large extent superseded by those in which steel rollers are employed in the manufacture of flour. The best specimens of this kind of stone are obtained in the Paris basin. (b) **Grindstones** were formerly produced at Newcastle, at Wickersley (eight miles east of Sheffield), and elsewhere in England; at various places on the Bay of Fundy in the Canadian Dominion; and in Ohio and Michigan in the United States, now almost entirely superseded. (c) **Infusorial earth**, or tripoli powder, is a fine siliceous earth used in polishing metals, glass, &c., and now also in the manufacture of dynamite, found not only in Tripoli, from which it takes one of its names, but more abundantly in Germany, on the Lüneburg Heath, between the Elbe and the Aller, and also in Scotland, France, Maryland (U.S.), and elsewhere.

Gypsum is produced most abundantly in the United States,

Canada, Great Britain, France, and Spain. It is used in the manufacture of Plaster of Paris.

Clays. The varieties of clay which have chief commercial value are china-clay and fire-clay. (a) Among producers of **China clay**, the United States, with sales of over 1½m. tons in 1950, easily heads the list, and is followed by Great Britain, where production in 1950 approached ¾m. tons. In Britain the clay is largely worked in the east of Cornwall and the south-west of Devon. Besides being used in the making of porcelain it is employed in the making of paper and cotton size. (b) **Fire-clay** is used in making fire-resisting bricks, crucibles, &c. In Great Britain the deposits chiefly worked are those found on or near coalfields (south Staffordshire, Glamorgan, Durham).

Asbestos has a great variety of uses—in gas-stoves, for the making of fire-proof curtains, as a packing for cylinders, and as a heat insulating covering for steam boilers and pipes, for making fire-proof paint, wall decorations, clothing for furnacemen and others. Upwards of 75 per cent. of the known world production (over a million tons in 1950) is derived from Canada (south of the St. Lawrence). Southern Rhodesia, South Africa and the United States provide most of the balance.

Ganister, a fine hard pure sandstone derived from the Lower Coal Measures, used for lining furnaces, is obtained for British use chiefly from the neighbourhood of Sheffield.

Fluorspar is chiefly produced in the United States, with Mexico, Canada, Germany and the United Kingdom (mainly Derbyshire) as the principal secondary sources of supply. It is used in lead smelting and in the making of ferro-silicon and ferro manganese.

Slate is less used than formerly for roofing but the waste, when finely powdered, is used in the making of bricks of great density and strength, also of pottery, green and amber coloured glass bottles and, above all, cement.

Monazite, a mineral used in making gas mantles and for other purposes, is found in grains scattered among other rocks, but is commercially available only where the rock is in the form of sand. The two chief sources of supply are India (Travancore), and Brazil (State of Bahia).

Building Stones. Building stones are widely quarried for local use but some have special characters which give them an international reputation. Amongst the latter are certain fine-grained limestones which split equally well in any direction and hence are called 'freestones'. The freestones or oolitic limestones of Bath and Portland in Britain are famous. Certain granites are also important, and there is a considerable trade in marbles.

Road Metal. A stone suitable for use as road metal must be tough, must not be splintery, and must not when broken give much

dust. Provided these qualities are present, local material is used. Various igneous rocks, especially basalts, are particularly good.

Cement and Lime. The burning of limestone for lime is an important industry but even greater is the manufacture of Portland cement from impure earthy limestones or from limestone mixed with mud or clay. The manufacture is more and more concentrated in large units.

COMMODITIES (*continued*)

IV. MANUFACTURED ARTICLES IN WHICH VARIOUS MATERIALS ARE USED

LEATHER. Leather consists of the skins of animals prepared in various ways. Its manufacture has given rise to an extensive commerce in articles of different kinds: first, in the hides and skins which form the raw material (see page 244); second, in the substances used in treating this raw material; and third, in the manufactured product—leather, and articles made from leather.

Tanning is the principal process in converting hides into leather. It consists in saturating the hides, after some preliminary cleaning and dressing, with a solution which alters the chemical character of one of the constituents of the hide, and renders the hide firm and durable. Nearly always this solution is derived from some vegetable substance, the bark or some other portion of a tree or other plant, which yields the necessary principle called tannin, or tannic acid, a very powerful astringent. Substances containing this principle exist in the native vegetation of almost all parts of the world, and the discovery of the art of making leather by means of them appears to have been made independently in many different regions at a very early date. The processes of tanning are represented on the older Egyptian monuments, and the North American Indians knew how to make a pliant and excellent leather before the European discovery of America. On the other hand the art was unknown throughout a large part of central Africa south of the Sudan.

Till just over 100 years ago, oak-bark was the agent almost exclusively used for tanning in Great Britain; now it is only one of fifty or more competitors, chiefly extracts of wattle bark and quebracho, and myrobalans. Other barks and bark extracts, as well as gambier, sumach, valonia and divi-divi, are also notable tanning agents. In all, the United Kingdom imports were nearly 1½ m. cwt. in 1938, and nearly 2½ m. cwt. in 1951, when they were valued at nearly £5½ m.—more than five times the pre-war value. Extracts are now predominant: an example of the growing tendency to engage in the manufacture or partial manufacture of raw materials in the country of origin, both to save freight and to promote local industry.

Myrobalans are imported chiefly from India. They are the fruits mainly of two species of trees of the genus *Terminalia*, abundant in Indian forests, and are the principal substances used in India for tanning. **Wattle bark and extract** come chiefly from Natal, with Kenya as a more recent source of supply. In Natal the wattle bark is derived from various species of acacia, the best being that of the *Acacia pycnantha*, Benth., or black wattle (introduced from Australia), a bark that yields nearly a third of its weight of tannin, and the *A. mollissima*, Willd. **Quebracho** is a modern export from Argentina and Paraguay, used for the rapid tanning of cheap leather. It is an extract from the wood of a tree, *Aspidosperma Quebracho*, Schlecht., native to the forests of the Parana-Paraguay basin, and is exported in very large quantities, especially to the United States. Soaring prices after the Second World War led to a decline in the demand, but there has since been a recovery.

Barks include different kinds of oak-bark, larch-bark and others found in Britain and elsewhere in the northern hemisphere; also mangrove bark from tropical and sub-tropical regions. Both in the United States and in Canada hemlock spruce bark is one of the principal tanning agents. Bark from the native oak is still used for the best leather, as it is in Canada, but supplies are becoming very scarce and are mostly confined to the southern Appalachian region. Chestnut trees were formerly the third most important source of tannin in the United States, but supplies have dwindled almost to nothing, because most of the trees have died of chestnut blight. There is a large and varied import of tanning agents into the States.

Gambier is extracted from the leaves of a shrub (*Uncaria Gambier*, Roxb.), belonging botanically to the Cinchona family, a native of the Malay Peninsula and the Eastern Archipelago. It is also used in dyeing, and in China is much used for chewing, along with betelnut. Having the tannin concentrated by the process of extraction, one ton of gambier will go as far as six tons of oak-bark in tanning. **Sumach** consists of the powdered leaves and young twigs chiefly of one species of shrub (*Rhus coriaria*, L.), and is imported from the Mediterranean, above all from Sicily, where the best quality is cultivated. **Valonia** is the name given to the acorn-cups of a species of oak which grows in Turkey. It is imported mainly from Smyrna, and is used in dyeing as well as tanning. Of other vegetable substances used for tanning the best known perhaps is **divi-divi**, which consists of the twisted pods of a leguminous tree known as *Cassalpinia coriaria*, Willd., a native of South America.

Attempts to tan with mineral substances were made for about a hundred years before the successful development of 'chrome tanning' with compounds of chromium. Most of the light leathers now produced are tanned by means of chromium salts.

For certain purposes skins are made into leather without tanning.

A soft flexible kind of leather suitable for gloves, &c., is made by a process called **tawing**, in which alum and other salts are the principal substances employed. **Wash-leather**, or chamois leather, is made by working oil into the cleaned skins. **Morocco leather** when genuine is made from goatskin, is always coloured on one side, and on that side has the well-known roughened surface imparted to it by means of a stamp, generally of boxwood. It takes its name from the country where it was first made, or through which it was first introduced into Europe. According to some accounts what was first known as morocco leather was really leather manufactured in Kano, in Northern Nigeria. By the Moors it was introduced into Spain, where Cordova and other Moorish cities acquired celebrity in connection with this product, so that the name of cordova leather or cordwain came to be applied as a general term for Spanish goatskin leather. About the middle of the eighteenth century the manufacture was introduced into Alsace, and since then it has been carried to all other industrial countries, and it has consequently declined in Spain, which for centuries supplied fancy leathers to all Europe. Russia leather is distinguished by its peculiar odour, which has this advantage, that it is so disagreeable to insects that the presence of a few books bound in this leather in a book-case is said to be enough to preserve the other volumes from their attacks. The odour is due either to the leather being tanned with the bark of the Russian birch, or to its being treated with a kind of oil made from the bark or the bark and roots of that tree.

The European countries in which the manufacture of articles from leather is most highly developed are Germany, France, and the United Kingdom. Germany is especially noted for its coloured leathers. France stands pre-eminent in its glove manufacture and is also noted for its lacquered or patent leather, a product first made in that country about the middle of the eighteenth century. Of the British exports of leather manufactures, the most important are boots and shoes—nearly 4½m. pairs valued at £1½m. in 1938; over 6m. pairs valued at nearly £9m. in 1951. The United States, as is natural for a country with vast areas devoted to the rearing of domestic animals and with vast native supplies of tanning bark, has a very large industry in leather.

PAPER. Paper is made chiefly from vegetable fibre reduced in water to a pulp so fine that the particles of fibre can scarcely be felt. Nowadays China clay is often added to the pulp, and, when not in excess, it improves the inferior qualities of paper. The pulp after being bleached by means of chloride of lime, is ready for paper-making, and for this purpose is kept by constant stirring as nearly as possible of an equal consistency throughout. When the paper is made by hand, as some of the best kinds still are, a frame called a mould, consisting of a piece of fine wire gauze bordered by a raised

rim, is introduced into the pulp by a workman, who, with the aid of another light frame, withdraws as much of the pulp as is necessary to make a sheet of paper. The water quickly drains through the wire gauze, leaving the vegetable fibres to form a thin moist film. This film when dried by various processes forms paper; not, however, paper that can be written on, but that soft porous kind which is used as blotting- or filtering-paper. To be made capable of receiving ink without allowing it to run it must be immersed in size (the essential ingredients in which are rosin and alum), and various other operations are necessary before writing- or printing-papers have the appearance and finish that belong to them when sold.

Machinery for paper-making was first used with success early in the eighteenth century. All such machines consist in contrivances for feeding a supply of paper-pulp equally to a revolving endless band or apron of fine wire gauze, and passing it thence to a similar apron of felt or flannel, and afterwards to pressing-rollers, &c. So perfect is the machinery used nowadays, that if pulp is constantly supplied to the machine a continuous roll of paper of any length (sometimes miles long) can be delivered from it in a finished state, either entire or cut up into sheets. The printing of newspapers is now done to a very large extent on the uncut roll. A large paper-making establishment on the Thames claims to have taken pulp from a steamer, made it into paper, despatched the paper to London, and had it returned to the mills as a book within four hours.

In the manufacturing countries of Europe and America the vegetable fibre for paper-making is very largely used in the form of wood-pulp, made from soft-wooded trees, that being the form in which supplies are most plentiful and cheapest. The best kinds of paper, at least in Western countries, are still made from linen rags; but the supply of these, and of cotton, woollen, and other rags, meets only a tiny fraction of the requirements of paper-makers. A kind of grass called *esparto* or *alfa*, which covers immense areas in the arid regions of southern Spain and northern Africa, from Tripoli westwards, provides a bigger share of the imports into Great Britain for paper-making (see p. 153), but does not seriously compete with wood-pulp. In 1938, out of 2m. tons of imports of paper-making materials, wood-pulp provided 83 per cent., *esparto* 15 per cent., linen and other rags under 1 per cent. In 1951, with imports more than up again to the 1938 level, but with the supply position complicated by the dollar problem, the proportion of wood-pulp was 77 per cent., of *esparto* 18 per cent., and of linen and other rags 2 per cent.

Two main types of wood-pulp are distinguished: mechanical wood-pulp, made by simply grinding down the wood-fibre, chiefly of spruces, pines and poplars; and chemical wood-pulp, made from the same woods by three processes, producing respectively sulphite,

sulphate, and soda pulp—names which are derived from the acid or alkali employed in the cooking. The mechanical pulp is inferior and used only in making cheap papers such as ‘newsprint’, on which newspapers are printed. The making of wood-pulp is carried on mainly where abundant raw material and water-power are found together. Into the United Kingdom wood-pulp is imported chiefly from Norway and Sweden, Finland and Canada.

The refuse of jute manufactures likewise affords an important material for the paper-making industry, which can also utilise directly a whole host of vegetable fibres, some of which—for example, the bast fibres of the baobab—are of great value for special purposes, such as the making of paper for bank-notes. In China and Japan, where the paper-makers excel the best European workmen in the making of some very delicate but strong papers, the material chiefly used is the inner bark of a tree known as the paper mulberry (*Broussonetia papyrifera*, Vent.), the leaves of which can be used in feeding silkworms. The strength of this paper is due to the fact that in making the pulp the long bast-cells are not broken and torn as in European pulping-machines, but merely softened and separated by beating. In taking up the pulp in the mould the cells are made to lie in one direction, and the paper may be strengthened by taking one or more additional dips, in which the cells are made to lie in other directions. Gums are used to make the cells of the pulp adhere. Thick papers are made capable of being used for many of the purposes of leather. The Japanese also make a very strong kind of paper from seaweed.

The history of the art of paper-making is of peculiar interest. The ancient substitutes were parchment and papyrus rolls. The latter were made by causing to adhere at their edges the thin inner skins found at the bottom of the stems of a kind of rush which grows in the Egyptian delta. The process was laborious and the rolls were costly, yet Egypt carried on a large and lucrative trade in them, and vast thickets of papyrus grew where now are fields of cotton, maize, rice, &c.

The art of paper-making does not seem to have been discovered independently in the West. From China it spread into central Asia, and a paper-factory was established at Samarkand early in the eighth century A.D., when that town was in the hands of the Arabs. By the Arabs it was introduced into Spain, and linen rags had come to be used for the purpose before the close of the twelfth century. It was probably for this reason that a small district situated to the south of Valencia in Spain, which had been celebrated in Roman times for its flax, was equally celebrated in the twelfth century for the excellence of its paper, which was widely exported. The art, if not first practised, was first firmly established in England in 1588, when a paper-mill was erected at Dartford in Kent, which county

had always been noted for this branch of industry. Into Scotland, where it is chiefly carried on in the counties of Mid and East Lothian, it was not introduced till near the close of the seventeenth century. Everywhere this industry is carried on, as might be expected, by the side of rivers or streams, which supply the water required for making and washing the pulp, and not far from great consuming centres. Wood-pulp is also bulky, so that cheap papers are made in mills by the side of navigable waterways, such as the lower Thames, where the raw material can be received direct from steamers. The availability of cheap power is another important factor.

Among European countries, the United Kingdom and Germany were, before the World Wars, rivals in the consumption of paper relatively to population, each being estimated to use upwards of 13lb. of paper per head in a year; whereas France, which came next, was estimated to consume less than 10lb. These are trifling figures compared with the annual *per capita* consumption in the United States, which is calculated to be over 200lb. Next to the United States comes Canada. To meet consumption in the States there is not only an extensive native industry supported by importation of pulp on a large scale, but a large import of paper. The United States now absorbs annually about four-fifths of Canada's exports of pulp-wood, pulp, and paper. Before the Second World War it was claimed that Canada accounted for three out of every eight newspaper pages printed in the world; during and since the war, with a newsprint capacity four times greater than that of any other country, Canada has provided more than half the newsprint production of the world and is second only to the United States in the production of wood pulp. From 1910 to 1924 Canada's consumption of wood for pulping rose from 75m. to 400m. cubic feet; in the ten years 1940-49, in spite of a falling off during the war, it averaged 700m. cubic feet; and in 1950 it was as much as 1,457m. cubic feet.

North America and North-West Europe together manufacture more than four-fifths of the world supply of wood pulp and paper. In the great forests of Scandinavia and Finland pulp is produced at low cost, largely because of their nearness to the sea, and large quantities are exported to the United States, as well as to the rest of Europe.

Paper factories on the European model have been erected in the principal countries of eastern Asia, and in India, near Calcutta and Bombay, have almost extinguished the hand-made paper, strong though coarse, once largely made by the Mohammedans of that country. The manufacture of paper of both Japanese and European types is an important industry in Japan.

During the War of 1914-18 Germany developed a large manufacture of paper yarn and cloth, and the cloth was said to be washable, sewable, soft, porous, and warm.

EARTHENWARE AND PORCELAIN. The simplest form of manufactured article made from earth, or rather from clay, is a brick dried in the sun. This was one of the earliest human inventions, and bricks of this kind are still made in Egypt and other parts of the Old World where fuel is scarce and sun-heat by day quite or nearly constant; also in those parts of the New World which have a similar climate, where they are known by the Spanish name of adobes. It was but a small step to the burning of bricks by artificial heat. The potter's wheel, by means of which mere steadiness of hand enables a workman to mould moist clay into a perfectly round form, is likewise an invention of great simplicity and great antiquity, though unknown, like every other form of wheel, in the New World before the time of Columbus. The method of glazing pottery is a less obvious discovery, and must have been due, like a host of other inventions, to some fortunate accident. The oldest specimens of earthenware are unglazed. Yet the art of glazing was known to the ancient Assyrians, Egyptians, and Etruscans, all of whom were noted among the nations of antiquity for their productions in pottery. Improvements in the potter's art were made by the Arabs during the period of their highest civilisation. By them the making of painted earthenware with a finely glazed or enamelled surface seems to have been practised before it was known to any European people. But the finest of all kinds of earthenware, the kind known as porcelain, was originally a Chinese invention, referred by Chinese chroniclers to the time of a dynasty which reigned in China from the second century B.C. to the first A.D. In Europe, this earthenware was unknown till the thirteenth century, and does not seem to have become widely known till it was introduced by the Portuguese about 1500, which accounts for the fact that the name porcelain (together with its equivalents in other European languages) is of Portuguese origin. It was two hundred years later before the art of making porcelain became known in Europe, where it was discovered independently. An inferior kind of porcelain was made at St. Cloud in 1695, but the true or hard porcelain, as it is called, was first made about 1709 by a German alchemist, Böttcher, who discovered it to be the product of a mixture of sand with kaolin or china clay, a fine kind of clay resulting from weakening or alteration of granite. A porcelain factory was set up at Meissen, in Saxony, and efforts were made to keep the art secret, but it gradually spread and is now carried on in all countries with a highly developed manufacturing industry. In Central Europe, it is largely concentrated in Bavaria and Czechoslovakia.

For the manufacture of ordinary pottery many kinds of clay will suffice if free from iron, which causes the clay to fuse during baking. Other ingredients are also used, such as burnt and powdered flint and phosphate of lime, the latter often in the form of bone-ash.

The decorations on ordinary pottery are painted on the unglazed ware, and are afterwards protected by a glaze composed of various ingredients fused together by a second baking. The glaze on porcelain is a thin coating of glass and the painting is done on the glaze with pigments of finely powdered coloured glass, after which the articles are again put into a kiln to be fired. An unglazed kind of earthenware known as *terra cotta* is moulded into statuary and other ornamental articles, and unglazed pottery is extensively used in the south of Europe, in Africa and Asia.

In England the manufacture of earthenware remained in a backward condition till after the middle of the eighteenth century. Its chief seat was Burslem, in north Staffordshire, a place well suited for this manufacture because of the great variety of clays and the abundance of coal in the vicinity. Among the clays of this district ('the Potteries') is a great abundance of the coarse clay used in making the *saggars* or *seggars* in which the earthenware is baked. Thanks to the presence of these two heavy materials, coal and coarse clay, the district continues to be the centre of the English manufacture of earthenware and porcelain, now that this branch of industry has attained greater dimensions in England than in any other country in the Western world. The finer kinds of kaolin for the manufacture are obtained (in the British Isles) solely in Cornwall and Devon, but it is cheaper to send kaolin to the Potteries than to bring the coal and coarse clay to Devon and Cornwall.

The first great improvements in English pottery were due to Wedgwood, who was born at Burslem in 1730, and since his day the art has been brought in this country to such perfection that the best English varieties of earthenware are unsurpassed if not unrivalled by those of any other part of the world. Besides the products of the Potteries, in the local sense of that word, England is noted for its ornamental stoneware (the hardest and heaviest kind of earthenware) made chiefly in London (Lambeth). In recent years there has been a great development in the use of glazed tile—in bathrooms, &c. About 1885 the United Kingdom exported earthenware and porcelain to the value of three or four times the value of its import. Later, the proportion of the imports increased, but declined again before the Second World War. In the three years 1936–38, exports of 'Pottery and other shaped and fired clay products' (as the Board of Trade returns classify all such goods) averaged £4m., and imports £1.3m. Under the abnormal conditions which obtained in the years following the war, exports shot up in value to over £27m. in 1951, while imports were still valued at around £1m. The British Commonwealth (especially Canada and Australia) and the United States provided the best markets.

Both Germany and France are important centres of manufacture. It was a tradition of the former German Federal rulers to

encourage the art. Prussia, Bavaria, Saxony, all had their royal 'Porzellan-Manufakturen', mostly fed by bounties. In Saxony, Meissen (north-west of Dresden and the true home of 'Dresden China') vied with Sèvres, near Paris, in producing the most beautiful coloured porcelains known. Now they have lost some of their pre-eminence, and English porcelain ranks with the best. Since the Second World War the historic Meissen brand—the crossed swords—has been replaced by the Soviet Star.

In the United States the home industry developed rapidly under the protection of high import duties. In the East, China is still noted for its porcelain, and so is Japan, into which the art was introduced from China. Normally, China still exports a considerable quantity of fine chinaware; Japan has developed a big trade in cheap china. Hardly any other branch of industry has so many names relating to the geography and history of the art in general use in connection with it. In English, porcelain is very commonly known by the appropriate name of china-ware, and kaolin as china clay. The name **majolica** was given by the Italians to painted and enamelled earthenware which they appear first to have become acquainted with as a product of the island of Majorca, and the name has been adapted into English. **Faience** is a name for the same kind of ware derived from the Italian town of Faenza, where it was first made in Italy. **Delft** is the name of another kind of painted and enamelled ware first made at the town of that name in Holland, and painted blocks of this kind of ware are generally known as Dutch tiles.

GLASS is made by melting together various ingredients, of which silica is always the chief, and is the only one that enters into the composition of all kinds of glass. Silica is one of the most widely diffused substances in nature, and is found in various forms, quartz (the main constituent of most sands) and flint being the most familiar. Sands are usually impure, discoloured, it may be, by iron, or mixed with lime or other ingredients; but sometimes they consist of nothing but silica, and such pure sand or sandstones afford the best material for glass-making, the sandstones being first crushed. In England various deposits of sand, at King's Lynn in Norfolk, at Hastings, and Leighton Buzzard, have in turn been noted for the excellence of the material which they afforded for glass-making. In France the most famous deposits are the sandstones of Fontainebleau. The United States possess exceptionally fine glass-sands in the west of Massachusetts and elsewhere.

Along with silica there is always fused in the making of glass some alkaline substance, either soda or potash. Glass made solely from soda is perishable, and in the making of most kinds of modern glass, lime is added. Soda is chiefly used in the forms of carbonate of soda and sulphate of soda, which are largely manufactured for

the purpose; but for some of the commoner sorts of glass, as bottle-glass, common salt is sometimes used. Potash is generally used in the form of carbonate of potash (the pearl-ash of commerce), sometimes in that of nitrate of potash or saltpetre. The glass made from potash is the freest from any tinge of colour, but that made from carbonate of soda, besides being nearly colourless when the other ingredients are pure, is easier to work in the state of partial fusion in which glass is usually treated. For ordinary purposes, accordingly, this substance is preferred. Potash is used either with or without lime in the manufacture of some of the best kinds of glass, such as Bohemian glass and English flint glass (crystal). In making this last kind of glass, lead (generally in the form of red lead) is used instead of lime, rendering the glass softer and more fusible and lustrous. The use of lead is an English invention of the eighteenth century. Besides these ingredients various others are used for special purposes, as to remove colours¹ which some impurities in the materials employed in making the glass might impart, or to give colours desired to coloured glass. In the making of bottle-glass, the colour of which is an unimportant consideration, very varied ingredients may be employed. In Germany some kinds of rock, such as basalts, trachytes, and granites, which contain a certain quantity of soda and potash along with from 65 to 75 per cent. of silica, and are easily fusible, have been employed with success in glass-making.

After the fusion of the materials glass is worked at a high temperature in a soft and somewhat pasty condition, and it is frequently re-heated. The implement chiefly used is the blow-pipe, by means of which balls of the glass paste are blown out into hollow forms. To make bottles and similar articles, almost all that is necessary is to blow the glass in moulds of the proper shape. When flat sheets are required, different methods are employed. By the old method a ball of blown glass was twirled round and round without blowing till it spread out flat except at the middle (the bull's eye). By another it is blown and twirled into a long cylinder, which is then cut on one side longitudinally and laid flat. Only the best kind of glass, made from the most carefully selected materials, is capable of being rolled out into sheets by means of steel rollers. Glass so made is called plate-glass. Flint-glass is the kind best adapted for being cut and engraved in the cold state. Before the First World War, Jena glass, a very fine kind of glass used for scientific purposes, was made exclusively in Germany, but efforts have since been made to deprive Germany of that monopoly. In the glass industry automatic and semi-automatic machinery is now extensively employed.

All kinds of glass before being ready for use have to be annealed, or to undergo some equivalent process for enabling them to stand

¹ For this purpose manganese is chiefly used, but when in excess this substance itself imparts an amethyst hue to the glass.

ordinary usage at ordinary temperatures. If suddenly removed from the temperature of the glass-works into the open air, they would be so fragile as to break at the slightest shock. The process of annealing consists in cooling them slowly and equally, so that no difference of strain in different parts of the glass is brought about by differences of temperature. Since 1875 different processes of making hardened or toughened glass have been tried, and hard cast glass has been made in forms suitable for railway sleepers, tramway rails, grindstones, and floor-plates, the glass so treated being run into moulds made of a mixture which becomes heated and conducts heat at the same rate as glass. By using potash or soda in excess, a kind of glass can be made which is soluble in water, and is used among other purposes as a protective coating against the action of the weather on calcareous building stones where, combining with the calcium salts, it forms an insoluble compound. Various types of unbreakable and safety glass are now made, often by a number of thin sheets being united by some tough transparent cement.

The invention of glass took place in prehistoric times. It was known at a very early period in Egypt, but the oldest piece of transparent white glass of which the date is known is a vase found among the ruins of Nineveh and now preserved in the British Museum. It has inscribed upon it the name of Sargon, an Assyrian king who reigned about the close of the eighth century B.C. In ancient times the Egyptians and Phœnicians were the two peoples most noted for their glass-making, for which both Egypt and Phœnicia supplied excellent sand, the former near Alexandria, the latter in the bed of the small river Belus (now the Naman), which enters the sea near Acre. The alkali in Egypt was obtained from the Natron (soda) Lakes situated to the west of the delta. In Italy the making of glass does not seem to have been practised till about the beginning of the Christian era, and there is no positive evidence of window-glass having been used there before the third century A.D. In modern times the Venetians acquired celebrity for the beauty of their glass manufactures; the art began to be practised there soon after the foundation of the city. Glass-making is now pursued on or near all the most productive coal-fields. Belgium, which has local supplies of sand as well as coal, and manufactures soda compounds from imported materials, is the headquarters of window-glass manufacture in Europe, and also makes excellent mirror-glass. Czechoslovakia has also a large glass industry.

SOAP as a commercial product is a chemical compound resulting from the action of soda or potash on various fatty or oily substances, and hence, besides being an important commodity (unknown to the ancients) in its manufactured state, is the cause of a large trade in the various fats and oils that enter into its composition, as well as in the alkalis mentioned. Hard soaps are those made with

soda; soft, those made with potash. Glycerine is a by-product of the soap manufacture. The fatty substances principally used in the manufacture of soap in the United Kingdom are tallow, coconut oil, cotton-seed oil, palm-oil, and other vegetable oils. In the south of Europe the staple ingredient of this nature is olive-oil, along with which are used, in addition to those just mentioned, groundnut oil, oil of sesame, and many others (see pp. 221—27). Even the grease from sheep's wool can now be employed in this industry.

CHEMICAL INDUSTRIES. Of these only the most important can here be noticed, and only so far as to explain the large consumption of certain commodities.

Alkali. The commodities known as alkali represent perhaps the largest of all such industries—namely, those concerned with the preparation of carbonate of soda and caustic soda, which are chiefly used in the manufacture of glass and soap. In the Leblanc process (patented in France in 1794), the materials employed are common salt, carbonate of lime (generally in the form of limestone), coal, and sulphuric acid. Common salt—sodium chloride—is a compound of the metal sodium with chlorine, which when free is a gas; and in order to be converted into carbonate of soda, the sodium, or rather the oxide of sodium, has to be brought into combination with carbonic acid. This union is effected by different stages. First, sulphuric acid is made to act on the common salt, by means of which sulphate of soda or salt cake and hydrochloric acid are obtained, the latter passing off as a gas. Next, the sulphate of soda is converted into carbonate of soda, and in this stage the burning of coal or the heating of carbonate of lime furnishes the carbonic acid. The product obtained is an impure carbonate of soda which is known as black ash and is sufficiently good for use in soap-making; but for the making of glass and some other purposes it has to be purified. In soap-making, black ash is converted into caustic soda (a compound containing no carbonic acid) by treatment with quicklime.

This process or series of processes is now to a large extent superseded by another, called the Solvay process, in which common salt is converted into carbonate of soda by means of the carbonate of ammonium. A solution of ammonia is mixed with the salt, and carbonic acid then passed in as a gas. A further process enables the ammonia to be recovered and used over again. This method of making carbonate of soda is simpler than the first, and yields a soda highly valued by glass-makers for its purity. Before the First World War it was very largely practised in Germany, to the injury of the older alkali manufacture of the United Kingdom, but the post-war reorganisation of the British chemical industry by Imperial Chemical Industries, Limited, a combine of dye and other chemical producing companies formed in Great Britain in 1926, has revolutionised the position.

Potash, another alkali largely used in the manufacture of glass and soap, as well as a number of other chemical industries, besides forming a valuable manure (p. 291) used to be mostly made by the burning of vegetable matter, and the chief exporting countries were Canada, Russia, and other timber-producing countries. In France it has long been made from the grease of wool, which was largely a waste product. After the discovery of the great deposits of potassic salts in central Germany, however, that country became the great source of supply. Subsequently, important deposits were discovered in the south of Alsace and in the north-east of Spain, near Cardona. During 1914-18, efforts were made in various countries to extract it from different raw materials, as from minerals containing felspar. In the United States a variety of glauconite, occurring in a narrow strip in the states of Delaware and New Jersey, proved a source. Ferrocyanide of potassium is now an important by-product of the illuminating gas industry, being used either alone or along with potassium carbonate as the raw material in the manufacture of cyanide of potassium, which since 1890 has been more and more employed in the extraction of gold, either instead of or as a supplement to the amalgamation process.

Sulphuric acid, which is employed in a great many industrial operations, is chiefly made on a commercial scale from nitrate of soda and sulphur or iron pyrites, a compound of iron (often with more or less copper) and sulphur. The sulphur or iron pyrites is burned, and the resulting vapour acted upon (in leaden chambers) by nitric acid vapours obtained from the nitrate of soda, which is heated along with the very acid (sulphuric) which the subsequent operations are intended to produce. The nitric acid is recovered and used over again with little waste. Nitrate of potash (saltpetre) may be used instead of nitrate of soda, cheapness being the ground for preference. In more recent processes of manufacture, cheaper for the preparation of the very strong acids required in the coal-tar colour industries, and said to be cheap enough even for the more ordinary forms of the acid, the nitrates are not employed, but are replaced by platinum, in the presence of which the dioxide of sulphur is by a catalytic action more highly oxygenated through combination with the oxygen of water in the form of steam.

Bleaching Powder. The hydrochloric acid obtained in the first stage of the manufacture of carbonate of soda by the Leblanc process (p. 306) is utilised in the manufacture of bleaching powder, which is a compound of chlorine and lime. Manganese, in the form of the black oxide of manganese, is employed to free the chlorine from the hydrochloric acid, and the chlorine is then passed into chambers containing powdered slaked lime. The manganese is recovered for further use.

Sulphate of ammonia, a valuable nitrogenous manure, is one

of the by-products of the destructive distillation of coal in gas-making, of the shale-oil industry, and of aluminium manufacture (see also below). Another important by-product is **coal tar**, at one time applied only to the same purposes as wood tar (preserving ropes, timber, &c.), but now yielding a vast variety of products of use in the arts. Some of these are employed in the making of dyes of almost every hue. The first dye made from a substance extracted from coal tar was named mauve. It was discovered accidentally in 1856 by Dr. W. H. Perkin during another investigation, and was at once applied industrially in the celebrated dye-works of Messrs. Pullar at Perth. Other shades of a similar origin were soon discovered. At first this branch of industry was mainly carried on in Great Britain, the land of its birth, and the country most abundantly supplied with the raw material; later the chief seat of the industry was transferred to Germany, which became the dominant factor in world production and trade, while Great Britain was content to supply a large proportion of the raw materials. All that was altered by the First World War; probably no other industry had its geographical distribution so radically changed by that war. The materials used in the production of dyestuffs from coal tar are largely the same as those used in the manufacture of high explosives, and were recognised to be of vital national importance. In 1921 an Act of Parliament prohibited for ten years the import of synthetic organic dyestuffs and their raw materials into the United Kingdom, except under licence of the Board of Trade. Still more rigorous protective measures were adopted in the United States.

The result has been a complete reversal of the trade position. In the United Kingdom the imports of synthetic organic dyestuffs, which amounted to nearly 368,000 cwt. in 1913, dropped to little over 42,000 cwt. in 1938, and in 1951 were 33,000 cwt. (in 1949 they had been less than 10,000 cwt.). On the other hand, the exports of finished dyestuffs obtained from coal tar increased from under 49,000 cwt. in 1913 to nearly 80,000 cwt. in 1938, and in 1951 had soared to 250,000 cwt., valued at nearly £9½m. In the United States the value of the imports of coal tar dyestuffs dropped from \$7m. in 1913 to \$5m. in 1938, and \$2½m. in 1948, but rose to \$7m. again in 1951. Home production increased enormously, but such were the demands of the home market that up to the Second World War there was little if any development of the export trade, which remained almost negligible. In 1948, however, after the Second World War, the United States exported coal tar dyestuffs to the value of over \$63m. (\$31m. in 1951).

Alum, which is largely used in the sizing of paper, dyeing calico-printing, painting and the preparation of colours, the tawing of leather and other industries, is prepared by several processes from clay or slate. In former days it was relatively much more important

in the dyeing industry than now, on which account it had a very prominent place in the commerce of the Middle Ages.

Carbide. After 1892 an important industry sprang up as a result of the discovery in that year (almost simultaneously by Wilson in America and Moisan in France) that the carbide of calcium is formed when lime and carbon are fused together at the temperature of the electric furnace. It then became possible to manufacture cheaply the powerful illuminant acetylene gas, a compound of carbon and hydrogen which is formed by the action of water on calcium carbide. The carbon is mixed with the lime in the form of coke of the utmost attainable purity. Norway and Switzerland engaged in production and export, and large supplies were produced in the United States France, Italy and Austria. But with the spread of electric lighting the use of acetylene gas as an illuminant has declined.

Rayon. Until the beginning of the present century the textile industry depended on fibres of natural origin for all textile purposes. Since then new fibres have been produced by chemico-mechanical processes. In many characteristics these 'man-made fibres', as they are comprehensively called, are superior to the natural fibres, and their manufacture has developed rapidly into a major industry. Since 1925 their world production has exceeded the production of silk, and for some years (1940-43) during the Second World War it exceeded the world production of clean wool for clothing.

Because of their surface characteristics the new fibres were popularly known for many years as artificial silk, a description which survives in the United Kingdom trade returns. In the retail trade this description gave rise to obvious opportunities for misrepresentation, not always deliberate, and occasioned so much trouble that concerted action on a world scale was taken by the manufacturers to introduce a new name—rayon. In the United Kingdom the Textile Institute and the British Rayon Federation have accepted 'rayon' as an inclusive term covering all textile fibres not of natural origin. In most other countries the term is understood in this sense, but in the United States the definition is limited, officially by the Department of Commerce as well as industrially, to manufactured fibres of cellulose origin. The great bulk of all the manufactures of man-made fibres is of cellulose origin, the principal raw material being wood pulp or cotton linters; but there is a wide range of other possible raw materials, some of them not of cellulose origin, and the American limitation of rayon excludes nylon, which has a coal-tar base. Another source of supply is casein (milk), and experimentally textile fibres have been made from groundnuts.

Whatever the raw material, the essential feature of manufacture is to prepare from it a high viscosity fluid by solution in an aqueous medium or a volatile organic solvent, or by melting. The fluid is made to flow through orifices and then solidified by chemical action

(wet spinning), or by evaporation of the solvent (dry spinning), or by cooling (melt spinning). The filaments thus formed are drawn together and collected parallel or twisted together to produce a yarn. Alternatively staple fibres can be made by cutting the filaments into short lengths and these can be spun together on cotton, wool, or other spinning systems. Typical examples are viscose rayon (wet spinning), cellulose acetate rayon (dry spinning), and nylon (melt spinning).

In a Europe suffering from a shortage of dollars, one big advantage possessed by rayon over natural fibres is the comparative cheapness of the imported raw material. Weight for weight, raw cotton costs (1949) three to six times as much as wood pulp, and raw wool eight to ten times as much. The rapid expansion of the rayon industry before the Second World War, and its subsequent fluctuations, are shown in the following table.

Rayon:¹ Estimated Production in Million lb.

	1930.	1933.	1938.	1941.	1947.	1951*
U.S.A. .	128	216	287	573	975	1,294
Great Britain	48	82	132	134	201	369
Germany .	63	72	484	824	107	561
Italy .	67	84	268	420	150	288
France .	51	59	73	109	124	229
Japan .	37	99	541	465	36	369
World .	457	694	1,924	2,817	1,978	3,957

In 1951 other producers included Austria 95m. lb., Russia 90, Netherlands 80, Belgium 65, Poland 65 Czechoslovakia 62, Canada 58, Spain 50, Brazil 49, Switzerland 41, Sweden 38, and Norway 32m. lb. These amounts, totalling 725m. lb., together with those listed in the above table (3,110m. lb.), accounted for 97 per cent. of the world production of 3,957m. lb.

¹ Including all textile fibres not of natural origin.

* Figures extracted from the *Textile Organon*.

Oxygen, &c. Other recent chemical industries are the commercial manufacture on a large scale of oxygen, nitrogen and nitrogen compounds, and hydrogen. Oxygen is largely manufactured for various medical, scientific, and engineering purposes. Nitrogen is obtained from the air for the production of various nitrogen compounds used as fertilisers. In the German chemical works at Ludwigshafen it is directly combined with hydrogen to form ammonia. The production of calcium cyanamide or nitrolin is associated in Norway and elsewhere with the production of calcium carbide, which, when heated, absorbs nitrogen from the atmosphere, and in the same country water-power is made use of to manufacture nitrate of lime, nitrate of ammonia, and nitrate of soda. Hydrogen is now largely manufactured to harden oils for the preparation of margarine and to enable low grade oils to be used in the manufacture of soaps. It is required in large quantities in the process of 'hydrogenation', whereby coal, or a substitute, is turned into oil (as at the Imperial Chemical works, Billingham-on-Tees; see page 265).

Radium and Uranium. Pitch-blende, from which radium is extracted, is one of the commonest of the uranium minerals, which are found in smaller or larger quantities in most countries. Formerly, radium was the valued constituent; now, the atomic bomb has not only sent up the demand for uranium but brought its production within the realm of official secrets. The known chief sources of supply are the Belgian Congo (Katanga district), Canada (Great Bear Lake region), and Central Europe (Bohemia). Another of the uranium minerals is carnotite, which is also a source of vanadium; it is mined in the United States, chiefly in Colorado.

Alcohol has long been manufactured in Germany and elsewhere for industrial purposes, chiefly from potatoes and wood, but the development of the industry has been retarded in this country by fiscal regulations. In Germany the product is made undrinkable by the State, which holds a monopoly. The bulk of the raw material used as compared with that of the product favours the establishment of the factories in the agricultural districts.

EUROPE

Europe, the smallest of the continents, is, taken as a whole, the most densely peopled. Its situation and outline are peculiarly favourable to its climate. The whole area, except a small fraction in the north, lies within the temperate zone, and the great irregularity of its outline causes it to enjoy in a higher degree than any other continent the mitigating effects of the sea on extremes of heat and cold. Its westerly situation is of even greater importance in this respect, and its southern peninsulas have a peculiarly warm and equable climate, not only in consequence of the moderating effect of the Mediterranean Sea on the temperature, but also because these peninsulas are to a large extent protected from cold northerly winds by mountain-barriers on the north.

In temperate Europe there is the same increase in extremes of temperature from west to east as in other parts of the north temperate zone, and this is true to a certain extent even of the countries belonging to the Mediterranean region. Besides these peninsulas, or the greater part of them, nearly the whole of France and the British Isles, and the whole of Belgium and Holland, are outside of the area in which the mean daily temperature sinks below the freezing-point for at least one month in the year. On the other hand, the area in which the mean daily temperature is above 50° Fahr. for at least eight months in the year is almost confined to the Mediterranean region, although it includes also the west of France from about the Loire southwards. In the east of Russia the area in which there is at least one month with a mean daily temperature above 68° Fahr. extends as far north as the latitude of the Orkney Islands.

By far the greater part of the area of Europe has a sufficient rainfall for cultivation, so that south of the region in which the temperature puts a limit on agriculture, almost the whole of the lowland area, and even in the far south land at the height of between two and three thousand feet, is capable of being tilled. The deficiency of rainfall prevents the pursuit of agriculture chiefly in the south-east of Russia and in the interior of Spain. But though the rainfall is thus generally distributed, and occurs everywhere more or less all the year round, it is most abundant at different places during different

seasons. The west, and above all the north-west, is the region in which autumn rains prevail, the east that in which there is a predominance of summer rain, but the Mediterranean peninsulas are the only region in which there is a marked deficiency of rain during any particular season. There the rains are chiefly winter rains, and the middle of summer is remarkable for its drought, to the south of about 40° N. almost rainless. These winter rains are apt to be very



EUROPE POLITICAL, 1913

violent and are blamed for the denudation of large areas, especially in the neighbourhood of some of the most populous sites of antiquity, where the needs of the population caused the mountain slopes to be stripped of their woods. It is thus clear that Europe embraces a number of the climatic regions described on pp. 32-49.

The **Mediterranean** type is found in those lands round the Mediterranean Sea, but in the eastern Mediterranean there is a marked increase in winter cold and summer heat. The **North-West European** type is found as far east as Denmark and central Germany where, with at least one month below freezing, it gives place to the

Central European type and then in central Russia to the **Eastern European** type. In southern Russia (with an outlier in the Hungarian Plain) is the **Mid-continent Grassland** type of great extremes and with a rainfall mainly in spring. This fades into a **Temperate desert** around the Caspian Sea. In northern Russia, Sweden, and Norway is the **Cold Temperate** type fading northwards into the **Tundra**.

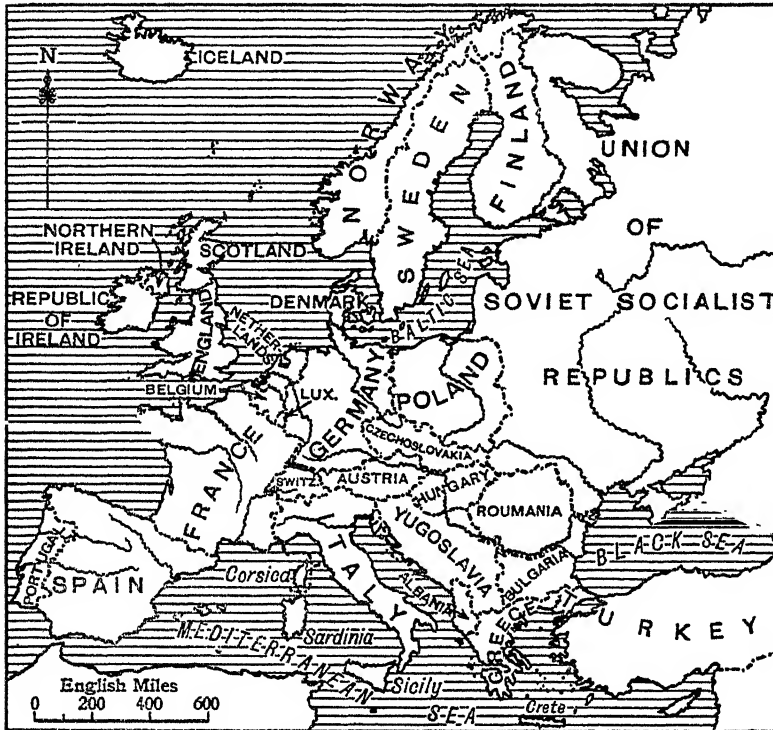
Many of the cultivated trees and plants now thoroughly charac-



EUROPE POLITICAL, 1937

teristic of certain parts of Europe are known or appear to have been introduced into that continent within historic times. The olive, the cypress, and the laurel, the evergreens now so characteristic of the Mediterranean peninsulas, and so well adapted to stand the dry summers of that region, seem all to be of Asiatic origin, though introduced at a very early date. Of Oriental origin also is alfalfa or lucerne, the equally characteristic fodder-plant of that region, the deep-rooted ally of the clover which survives the driest summers, and hence has been introduced into many other parts of the world with a similar climate to the Mediterranean. From Asia also came

the fig, mulberry, almond, walnut, chestnut, and apricot, all before the birth of Christ. The mulberry of the ancients, however, was the black mulberry, the sycamine of the Greeks, the white mulberry being a much later arrival from the East. From Asia likewise came at various dates, mostly after the beginning of the Christian Era, rice, cotton, and several members of the orange genus (citrons, lemons, and oranges proper). After the discovery of America, agaves



EUROPE POLITICAL, 1950

and cactuses, potatoes, maize, and tobacco were added to the vegetation and agriculture of this continent.

The chief cereals of Europe seem to have been cultivated there in prehistoric times; wheat and barley, as well as two kinds of millet, are proved by remains found beside the Lake-dwellings of Switzerland to have been cultivated in the later Stone Age. Many of our common cultivated plants, including cabbages, peas, vetches, parsley, and onions would seem, on the evidence of language, to have been introduced into central and northern Europe from Italy.

At the present day Europe is to a larger extent a manufacturing

region than any other continent, but the predominance of manufactures is characteristic only of certain countries. Before the Second World War manufactured goods provided half or more of the value of exports of native origin from the United Kingdom, France, Belgium, Germany, Switzerland, Italy, and Czechoslovakia. In other European countries the chief exports are often still products of the soil, the forest, or the sea, but usually partially manufactured or prepared. One of the most important facts in the commercial history of the continent within recent years is the extent to which its agriculture has been affected by the rapid development of commerce in grain with many parts of the world in which wheat and other crops are produced under exceptionally favourable conditions.

Inland waterways of Europe. The countries of northern Europe are separated from the countries of Mediterranean Europe by a great barrier of mountains—the Pyrenees, Alps, Carpathians and their associated smaller ranges and plateaus. Consequently the natural gaps through these mountains have always been of the utmost importance as affording routeways, whilst even the difficult passes of the Alps have assumed a special significance. Generally speaking, the climate of northern Europe with its well-distributed rainfall is such as to afford a constant supply of water to the rivers, and this factor, combined with the generally level character of the north European plain, has led to an extensive use of waterways as highways of commerce. The rivers have been improved, in some cases canalised, and linked by canals so that the waterways are specially significant in France, Belgium, Holland, Germany, Poland, and Russia. On the other hand, the rivers of the Mediterranean lands, owing partly to the seasonal character of the rainfall, are of less importance. The one great river, the Rhone, which flows into the Mediterranean from the north, has afforded a valley routeway of special note. Unfortunately, the great river of central Europe—the Danube—flows into an enclosed sea, the Black Sea, and loses thereby much of its value as a commercial highway.

The Danube itself is an important international waterway. It is navigable by steamers from Ulm downwards, by barges of 1,000 tons from Ratisbon to Turn Severin, and from that point by sea-going vessels, a total length of upwards of 1,500 miles. The navigation is subject to the drawback of interruption by fixed or floating ice for about two months in the year, and a still more serious disadvantage is the character of its banks, especially below Budapest, these being so marshy as to afford comparatively few sites for towns. To these causes may, in a large measure, be ascribed the fact that before 1914 the total tonnage of traffic at Vienna was less than one-tenth of that of the Seine at Paris.

The most important of the inland waterways in Europe is the

Rhine, and next in importance, in respect of volume of traffic, are the waterways connecting northern France and western Belgium. Under pre-war conditions the Rhine and Marne canal carried large quantities of coal in both directions and some thousands of tons of iron ore from France into Germany. Two of the great European canals are in Germany: the Dortmund-Ems Canal, connecting the Rhine with Dortmund and the port of Emden; and the Mittelland Canal, completed in 1938, connecting three rivers, the Ems, Weser and Elbe. The Kiel Canal, connecting the mouth of the river Elbe on the North Sea with the Baltic port of Kiel, enables ships to cross from the Baltic to the North Sea without going round Jutland. Before the Second World War the tonnage carried was equal to two-thirds of that carried on the Panama Canal.

Czechoslovakia, though an inland state, has a direct water outlet to the North Sea through the Elbe, which rises in Bohemia and is navigable below its junction with the Moldau, north of Prague. Poland makes extensive use of the Vistula and its tributaries.

Various projects for connections along routes that seem to offer the prospect of heavy, bulky traffic of the kind suited to inland waterways are or have been at various times under consideration. But in general waterways are decreasingly used, though Russia in particular has been active in linking her main rivers and has constructed the White Sea Canal to afford a direct link between the Baltic Sea (*via* Leningrad) and the White Sea. Other important links—including the 63-mile canal, opened in 1952, which connects the Volga and the Don—combine with the White Sea Canal and the natural waterways of the country to provide a transport system affording direct communication between the White, Baltic, Caspian, Azov and Black Seas.

Routes linking Britain with continental Europe. The most important surface routes between England and the Continent for passengers, mails, and perishable and valuable goods, necessarily start from London, and are interrupted by the sea. The outports on the shortest sea-routes are Dover and Folkestone, connecting England with France by Calais and Boulogne respectively. The Dover-Calais route is shortest of all, being only 22 nautical miles as against 25 on the Folkestone-Boulogne route, but Boulogne has the advantage of being 27 statute miles nearer Paris. Dover also connects with Ostend (68 nautical miles) and by the train-ferry service, inaugurated in 1936, with Dunkerque. Other important outports are Harwich, from which British Railways steamers run to the Hook of Holland (the outport of Rotterdam; 101 nautical miles), Antwerp (141 nautical miles), and Esbjerg in Denmark (360 nautical miles); Newhaven, whence the British Railways run steamers to Dieppe (76 miles) for Paris; and Southampton, from which other British Railways steamers run to Havre (122 miles) and St. Malo. There

are also routes from Tilbury, Leith, Newcastle, and Hull to the Continent.

European Railways. Fortunately the railways of Europe, except in Russia and the Iberian peninsula, are on the same gauge throughout, thus permitting trans-continental through running. The gauge is the same as in Britain (4ft. 8½in.), though most continental rolling stock cannot be used in this country owing to the narrowness of our tunnels and bridges.

Paris is the great focus for the routes touching the coast of France at all the ports from Calais to Havre. The distance by rail from Calais to Paris, *via* Boulogne and Amiens, is 185 miles, and from Havre to Paris, *via* Rouen, 141 miles. The influence of topography on railway routes is well seen in the main line to the Mediterranean, which runs down the Rhone Valley east of the Central Plateau, and the main line to Spain, which runs west of that same plateau. The Pyrenees long formed a barrier to railway communication between France and Spain and until 1912 no railway actually crossed the chain, the links between the two countries being round the eastern and western ends.

The stupendous engineering feats necessary to surmount the obstacles afforded by the Alps will receive attention under the countries concerned. A notable through service is the Nord Express from Paris to Stockholm. The route goes through north-west Germany to Hamburg, then through Schleswig-Holstein into Denmark and on to Copenhagen, crossing the Great Belt by train ferry (31 miles). From Copenhagen another train ferry (20 miles) connects with Malmö in South Sweden, whence the journey is continued overland to Stockholm. The whole journey takes two days. A variant of this route which has been opened up since the Second World War and is of growing importance is now followed by the Italian-Scandinavian (Rome-Stockholm) Express. Instead of continuing to Hamburg it branches off at Hanover and runs to the north coast of West Germany at Grossenbrode, whence a train ferry connects with Gedser, the southernmost point of Denmark, on the island of Falster. Before the war Gedser was connected by train ferry with Warnemünde, in East Germany, but this service has been discontinued.

Among many other important through services it must suffice here to indicate the main trans-continental routes, leading eastwards to Russia, south-east to Istanbul (Constantinople), and into Asia. The Orient Express runs from Paris up the Marne valley, along the route of the Marne-Rhine Canal past Nancy, across the north of the Vosges to Strasbourg, where it crosses the Rhine, then northwards along the base of the Black Forest, and eastwards to the Neckar valley. At Stuttgart the route forks. One branch goes east and north *via* Nuremberg to Prague and Warsaw. The other

goes east and south to Ulm, on the Danube, thence *via* Munich and Salzburg to Linz, where it rejoins the Danube. It continues down the valley of the Danube to Vienna, Budapest, and Bucharest.

The Second World War restricted the service, which even now (1953) operates only on certain days beyond Vienna. The same applies to the Ostend-Vienna Express, which crosses Belgium and Germany *via* Brussels, Cologne and the Rhine Valley to Frankfurt-on-Main and Nuremberg, and crosses into the Danube valley, reaching Vienna by way of Passau and Linz.

The Arlberg-Orient Express, starting from Paris, crosses north-eastern France and northern Switzerland, *via* Basle and Zurich, into Austria; tunnels under the Arlberg Pass, and continues to Innsbruck, Salzburg and Linz, where it joins up with the Orient Express route already outlined, and continues *via* Vienna to Budapest and Bucharest.

A more direct route to Belgrade and beyond is that of the Simplon-Orient Express, which runs from Calais *via* Paris and Lausanne to Milan, across northern Italy *via* Venice to Trieste, and through Yugoslavia down the Save valley to its junction with the Danube at Belgrade, thence (since 1951) direct to Nish, Salonica and Athens. Since the war, the service to Istanbul has been restored thrice weekly, but owing to present (1953) frontier troubles in Bulgaria the service is temporarily diverted *via* Salonica and Alexandroupolis.

Railway Connections with Asia. From Haidar Pasha, on the Asiatic side of the Bosphorus opposite to Istanbul, the Turkish Railways continue on the standard gauge. The Taurus Express winds across Asia Minor and over the Taurus range down to Adana in the Cilician plains, near the north-east corner of the Mediterranean; mounts again over the Amanus range to Aleppo, continues eastwards across the Euphrates to Mosul, on the Tigris, and descends the Tigris valley to Baghdad. From Baghdad a metre-gauge line crosses to the Euphrates valley and follows it down to the Persian Gulf at Basra.

From Aleppo southwards a connecting service runs to Tripoli and Beirut, traversing a military railway, built by the British during the Second World War and now operated by the Syrian Railways. The section beyond Beirut to Haifa is not in use. From Haifa there is in normal times a through service to Egypt, but this is at present interrupted by the lack of co-operation between Israel and the Arab world; the Israeli terminal is Lydda and the Egyptian terminal Rafa. The railway from Rafa to Cairo crosses the Suez Canal by a swing bridge at Firdan, a few miles south of Kantara. There is in fact, as shown, a continuous railway communication between Europe, Asia and Africa, except for the crossing of the Bosphorus between Istanbul and Haidar Pasha, which could be made by train ferry.

The other great railway link with Asia is the Trans-Siberian line. On the European side the natural connecting route is *via* Berlin and Moscow. At the other end, railway developments in China made it possible, in 1936, to travel by rail directly from Calais to Canton (see pages 511-12).

Road and Air Routes in Europe. Road building has been carried to the pitch of perfection in western Europe, but eastern and south eastern Europe are still largely without all-weather motor roads.

All the great European cities are linked by regular air services. Not unnaturally, the greatest use has been made of the new mode of quick travel in those countries such as Russia where distance is a great enemy. Air services link Moscow with Iran (Persia) as well as with the Far East. The colonial powers—Britain, France, Belgium, Holland and Portugal—have developed air routes to their Asiatic and/or African territories, and transatlantic air services put Europe in regular communication with both North and South America.

THE BRITISH ISLES

The British Isles lie in the north-west of Europe, between the parallels of 50° and 60° N. To be more precise, the fiftieth parallel of latitude runs a little to the north of Lizard Point in Cornwall and the Scilly Isles, and the sixtieth through the southern end of the mainland of Shetland. The meridian of 0° passes, of course, through London (Greenwich) whilst longitude 10° W. passes through the western peninsulas of Ireland.

Prior to 1922 the British Isles formed the United Kingdom of Great Britain and Ireland. In that year 26 of the 32 counties of Ireland became the Irish Free State (afterwards the Irish Republic) so that the term United Kingdom became applicable to the United Kingdom of Great Britain and Northern Ireland.

The Surface of England and Wales. Of the countries which make up the British Isles, England is that which has the greatest proportion of the surface available for production or purposes subsidiary to production. According to the most recent agricultural returns, more than 70 per cent. of the entire area of land and water was under crops or grass or lying fallow, and when it is considered that about 5 per cent. of the surface was occupied by woods, and that a large area is taken up by towns, factories, roads, and railways, it will be seen that the area occupied by unproductive hill and moorland is comparatively small—about 11 per cent.

The hills and mountains of England are chiefly in the north and west. Indeed, Britain as a whole can be divided roughly into two halves, 'Highland Britain' and 'Lowland Britain.' Highland Britain occupies the north and west; lowland Britain the south and east. The Cheviot Hills with their broad spurs, and the tablelands of the Pennines, 'the backbone of England,' as it has been called, which runs from north to south from the Scottish border into the heart of Derbyshire, cover a considerable extent of ground, and are fit, so far as agriculture is concerned, for little else than sheep-pastures, so that in these districts the population is even now very sparse. Other extensive tracts with a relief too hilly or a soil too poor for intensive agriculture include the Lake District and the moorlands of Devon and Cornwall as well as certain tracts in lowland Britain such as the Yorkshire moors and parts of the chalk

hills and downs—Salisbury Plain and the Marlborough Downs in Wiltshire, and the Chiltern Hills. In addition, there are considerable tracts of light, hungry soil or sandy areas such as the Bagshot area south-west of London, the New Forest of Hampshire, and the 'Breckland' of Norfolk and Suffolk.

As will be mentioned below, the upland masses of the Pennines, the Lake District, and the south-west have rendered difficult the construction of roads and railways. Even in the south-east roads and railways out of London seek the gaps through the Chilterns or the North Downs, but otherwise physical features in the south and midlands rarely present insuperable difficulties to the development of a road and rail network.

In Wales the proportion of hilly and mountainous country is much greater than in England, and the area of land under crops or grass or in bare fallow is rather less than 54 per cent. against 30 per cent. occupied by moorland and rough pasture. The ranges of the Welsh hills are, however, short, and there are many openings allowing an easy passage for railways and roads.

The Surface of Scotland. Scotland is the most mountainous part of the British Isles, and its northern half has hills and mountains so closely packed together that even yet there are few roads leading through the narrow and sparsely peopled valleys between them. For long the only road across the Grampians—the mountains lying immediately to the north of the central lowlands—was that which leads up to the valley of the Garry, a tributary of the Tay, and after crossing the Drumochter Pass at the height of 1,484 feet, descends a tributary of the Spey to the valley of that river. This road is now accompanied by a railway, which is continued near the east coast to the most northerly towns of the mainland of the country (Wick and Thurso). Of the surface of Scotland less than one-fourth is under crops or grass or in bare fallow, and the greater part of the land suitable for cropping is confined to the area already referred to as the central lowlands, an area roughly definable as bounded by two parallel lines, one stretching from Stonehaven in Kincardineshire to the Firth of Clyde opposite Greenock, the other from Dunbar in Haddingtonshire to the southern part of the Ayrshire coast. In this lowland area there lies, moreover, most of the great mineral wealth—the coal—of Scotland, and therefore most of its manufacturing industry. It is this region which has at all periods of Scottish history been the most densely peopled part of the country and now contains a greater proportion of the population than ever.

Climate. The mildness and equableness of the climate of the British Isles as a whole have already been explained and illustrated under more general headings (p. 45). The special advantages of the climate of the British Isles with regard to production are that it is favourable to active exertion throughout the day all the year

round, and even for the most part stimulates to active exertion; that the mildness of the winter causes little or no interruption to field labour in any of the parts best suited to agriculture, and its comparative freedom from heavy snowfalls causes little interruption to communication; and that, for some reason or other, the climate seems to be unfavourable to the existence of insect pests which infest similar crops grown elsewhere, while, nevertheless, it is seldom unfavourable to domesticated animals. For the sake of comparison with other countries it is well to remember that the average annual rainfall at Greenwich (in one of the drier parts of Great Britain) is about 25 inches, and that while the average mean temperature of the hottest month at Greenwich is $63\frac{1}{2}^{\circ}$ F., at Edinburgh $58\frac{1}{2}^{\circ}$, that of the coldest month is about the same at both places, 39° . In general it may be said that the drier parts of Britain—the east—with an annual rainfall of 30 inches or less favour arable farming and the ripening of crops; the midland regions and lowlands of the west with between 30 and 60 inches a year are more suited to grassland farming, for crops are liable to suffer from too much moisture inducing ‘rust’ diseases. It is only in the highland areas of western Britain that rainfall or humidity conditions can be described as approaching the excessive and so rendering farming difficult. The distinction thus made between eastern and western regions is important as affecting legislation designed to encourage British agriculture.

The length of the shortest day (sunlight) varies from about $5\frac{1}{2}$ hours in the extreme north to eight hours in the extreme south. In the more thickly peopled region of Scotland the shortest day in the year is about $6\frac{1}{2}$ hours in length (in the latitude of Dundee). It is to be remembered also that the shortness of the day is to some extent compensated in the high latitudes to which the islands belong by the length of the twilight.

Agriculture. In the Middle Ages, before the Industrial Revolution was born, Britain produced a surplus of agricultural produce and both corn and wool were exported. Home agriculture flourished during the Napoleonic Wars after which, despite temporary setbacks, it continued to flourish until the peak was reached in the eighteen-sixties and seventies. Then, the corn laws repealed, began the great expansion of production in the new lands of the United States, Canada, Argentine, and Australia. Cheap food flowed into Britain as payment for manufactured exports and for services rendered. Farming in Britain became a neglected industry. The whole pattern of farming and with it the face of the countryside changed. Farmers economised in labour by turning over from ploughland to grass: acreage under crops, especially cereal crops, decreased accordingly, whilst that under permanent pasture expanded. Marginal and poor land was abandoned and so the acreage of

rough grazings steadily expanded. Industry and housing cut steadily into the acreage of farm land. During the First World War the submarine menace threatened food supplies and there was a temporary rise in ploughed acreage and output, especially in 1918, but in general the trend continued to 1938. In that year the threat of war resulted in a change: with the outbreak of war in 1939 enormous energy was put into the farming industry and home production. Owing to the demand of land for airfields the total available in 1943—a peak of wartime production—was actually less than in 1938, but the annexed table shows the remarkable changes. Ploughland was increased by nearly 50 per cent., wheat and barley acreage almost doubled. As a result home food supply was increased from a little over 35 per cent. of consumption to about 55 per cent. The former reliance on imported feeding stuffs for animals gave place to the home production of all but a small fraction of the 10m. tons previously imported. Indeed, each farmer was required to grow his own to avoid a burden on internal transport.

When the Second World War ended, the necessity of maximum home food production remained so that foreign currency could be conserved for the purchase of vital raw materials. The sale of Britain's overseas investments to pay for the war meant that there was no longer an automatic flow of foodstuffs and raw materials as interest which there had been previously.

The revolution in British agriculture was accomplished with the help of mechanisation. The 'average' farm worked as a full-time holding in Britain is about 99 or 100 acres—where rough grazing is included it is reckoned as 10 acres equivalent to one of permanent pasture. There are about 420,000 'farms' in England, Wales, and Scotland, but many of these are small part-time holdings and the number of full-time farmers in England and Wales in 1941 was 216,000, with about 50,000 in Scotland. The table opposite shows that there were in 1950 nearly as many tractors as the total of farm horses, and that broadly every farmer has at least one tractor as well as a whole range of other mechanical farm implements. Britain can now claim to be the most highly mechanised farming country in the world. The output per acre of crops and the stocking of land by animals is very high—Britain ranks a little below Denmark, Holland, and Belgium, who are the leaders in this respect.

The British climate is more suited to grass and fodder crops than to wheat, so that home production was concentrated on milk, in which the country is self-supporting, and dairy produce, leaving a large proportion of the wheat for bread to be imported. Though the wartime effort brought the wheat acreage almost back to the peak of 3,840,000 which it was in 1872, the population in the meantime had greatly expanded. The total import of wheat between 1913 and 1935 ranged from 4·8 (1918) to 6·6 (1931) million tons.

This was cut to an import of 2·8m. in 1944 in the height of the war, and to an average of 4·0 in 1946–50.

GREAT BRITAIN AND NORTHERN IRELAND

	1938	1943	1950
Total land area (acres)	59,533	59,533	59,533
Crops and grass	31,755	31,058	31,126
Arable land	12,957	18,728	18,356
Permanent grass	18,798	12,330	12,770
Wheat	1,928	3,464	2,479
Barley	988	1,786	1,778
Oats	2,395	3,680	3,105
Sugar beet	336	417	429
Temporary grass	3,968	4,219	5,606
Rough grazings	16,589	17,119	17,103
Cattle total	8,762	9,259	10,620
Cows in milk	c2,800	2,910	3,139
Sheep	26,775	20,383	20,430
Pigs	4,383	1,829	2,986
Poultry	74,246	50,729	96,109
Horses used for agriculture . . .	748	693	396
Tractors	—	117	332
Wheat harvest (tons)	1,965	3,447	2,606
Barley harvest (tons)	904	1,645	1,711
Oats harvest (tons)	1,992	3,064	2,692
Sugar-beet (tons)	2,191	3,760	5,216

All figures in thousands

The growth of the beet-sugar industry in this country is of special interest. Experimentally sugar-beet had been cultivated on a small scale in various parts of England before the First World War. In 1911 experiments were made at the instance of the Development Commissioners at seven stations scattered over the south, south-east, and midlands of England, and as the result of those experiments the Commissioners regarded it as proved that beet giving yields equalling, if not exceeding, those obtained on the Continent could be grown in England. A factory was built at Cantley, near Norwich, in 1912 but largely with Dutch capital. The industry was not established when war broke out and the factory was closed. After the war assistance was given by the removal of the excise duty in 1922. In the budget of 1924–25 the import duty on sugar was reduced from 21s. to 11s. 8d. per cwt., and the Government subsequently agreed to grant a subsidy of 19s. 6d. per cwt. on home-made sugar (for the first four years, thenceforward being gradually reduced) but with an excise duty of 9s. 9d., thus giving a subsidy to the industry of 21s. 5d. per cwt. By 1931 there were seventeen factories in operation in England and Scotland and the output for 1930–31

was 422,700 tons, against 291,500 in the preceding season or 50,000 in 1925-26. The subsidy was due to cease in 1935 but the industry, though of great value to the farmers in East Anglia, was unable to carry on without some measure of protection. With continued subsidy the acreage under beet rose to 336,000 in 1938 and continued to expand during the Second World War, reaching 436,000 in 1946. The harvest of 1950 (5,216,000 tons) was a record to that date. In 1947, 606,000 tons of sugar were made. The sugar-beet industry is advantageous to that of cattle-rearing. Further, it is an industry essentially attached to country districts as opposed to large towns. Where considerably more than 80 per cent. of the raw material is a waste product so far as sugar-manufacture is concerned, and this waste as a by-product finds its market in the same district as that in which the raw material is grown, the advantage of having the sugar-factories close to the beet-fields is obvious. The factory industry is essentially a seasonal one, being carried on only for three or four months during the winter—after the beet-harvest. It accordingly is one that provides employment in country districts at a period when agricultural employment is slack, and is at the same time an aid in maintaining the labour supply for those districts all the year round.

Geographical factors influencing the growth of Britain's prosperity and trade. Until about 1900 the foreign commerce of the British Isles was much greater in value than that of any other country in the world, and greater also per head than that of most other countries in which there was a population of great density. The export trade fell behind that of the United States from 1900 to 1931 absolutely, but not per head. This shows that for foreign commerce this country must have peculiar advantages of one kind or another, and we must therefore consider what these advantages are. First of all it will be well merely to enumerate these advantages, as well as the disadvantages under which this country labours—or at least laboured until the First World War—and afterwards to examine more particularly the nature of those which require elucidation and to note in what ways there have been changes since 1913 in the influence of the factors concerned. It should be noted, however, that in this enumeration the sole point of view is the immediate interest of commerce. It is not intended to hint that all the so-called advantages and disadvantages are necessarily to be regarded as such with reference to the well-being of the people.

The advantages were:—

- (1) A favourable climate.
- (2) The abundance of coal and iron and some other raw materials, especially raw materials leaving much waste.
- (3) The efficiency of British labour.
- (4) The fact that nearly all the great mechanical inventions by

which modern industry has been revolutionised originated in this country, which thus got the start of other countries in their application.

- (5) The abundance of capital.
- (6) The concentration of population in our industrial regions, facilitating the organisation of industry, including the minutest subdivision of labour.
- (7) The completeness of the internal communications.
- (8) The nearness of the coast on all sides.
- (9) The numerous seaports.
- (10) The geographical position.
- (11) The magnitude of the shipping.
- (12) The extent of the British colonial and other possessions.
- (13) The extent to which the English language is spread over the globe.
- (14) The long establishment of our commercial relations with the best markets of the world.
- (15) The free trade policy that prevailed in this country for more than seventy years.

The disadvantages that have to be placed on the other side are:—

- (1) The dearness of land arising from the density of population and the great development of industry, a disadvantage necessarily most experienced in the great centres of industry.
- (2) The deficiency of large water-powers, now essential in some branches of industry (p. 72).
- (3) The higher rate of wages long paid in Great Britain compared with those paid by its chief rivals in manufacturing industry.
- (4) The government and self-imposed restrictions on labour.
- (5) The backward state of education, and especially of technical and commercial education, which existed in the United Kingdom compared with the point reached in this respect by some of its rivals at least until 1900 or even 1914.
- (6) The irrational spelling of the English language.
- (7) The want of a decimal coinage and system of weights and measures.

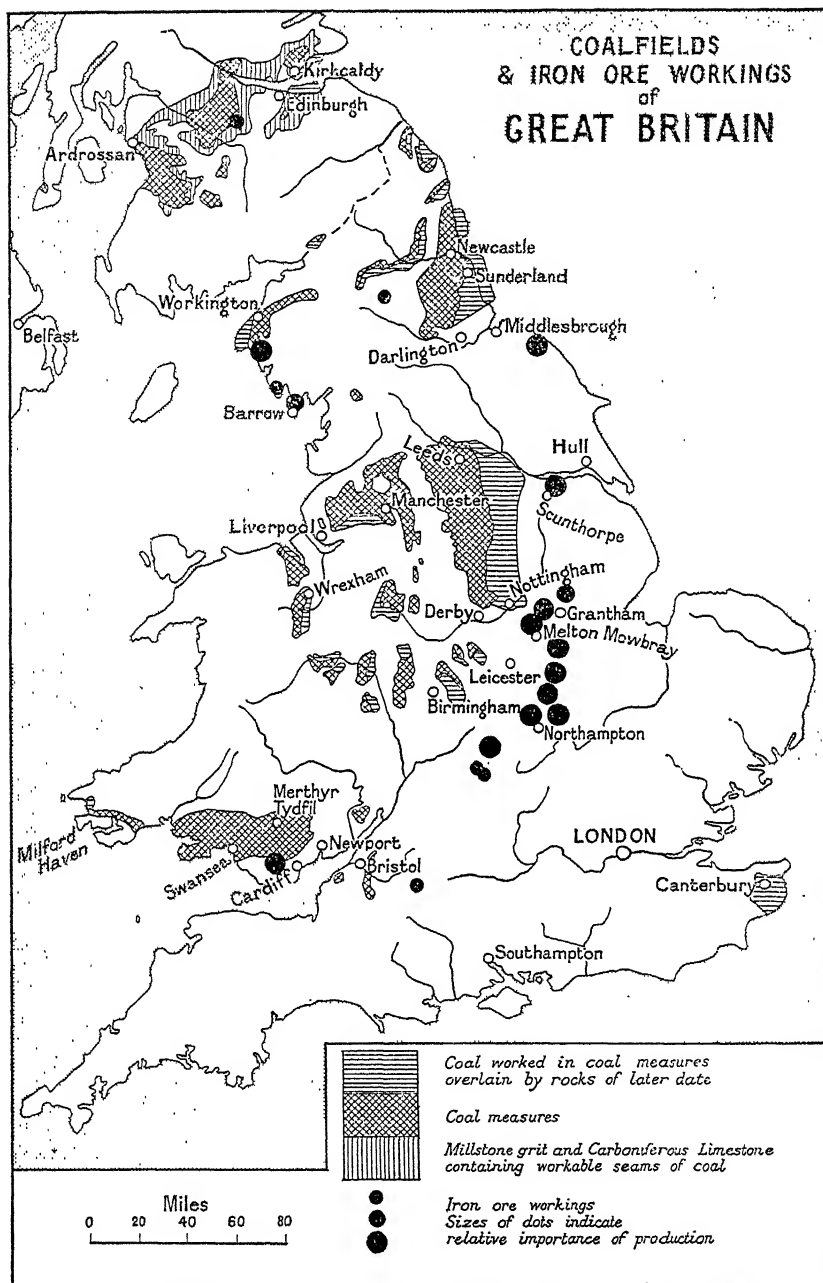
(8) The high tariffs of many countries of the world while Britain still followed a free trade policy.

(9) Currency restrictions imposed in many countries of the world.

It scarcely needs to be pointed out that the advantages and disadvantages above enumerated are not mentioned in the order of their importance. Of the advantages, those from 1 to 6 are such as affect the production of articles of commerce, and the remainder, those which pertain to their distribution; and of the former, Nos. 1 and 2 may be reckoned as natural advantages, Nos. 4, 5, and 6 advantages mainly due to historical causes. No. 3, the efficiency

of the British artisan, is largely an historical advantage, due to the acquired skill resulting from the experience of generations and from familiarity with a gradual and constant series of improvements in industrial operations.

With regard to the advantage of the climate it is unnecessary to say more; but in relation to the second of the advantages enumerated above, wealth in coal and iron, it is necessary to point out that the advantage we possess arises not only from their abundance, but also from the fact that important supplies of both are found quite close to seaports, and that the coal necessary to the smelting of the iron is at no great distance from the iron ores, though the old iron ores of the coal-fields themselves are almost completely worked out. It should also be noted that technical advances in the utilisation of coal, especially in connection with the iron industry, have redounded further to the advantage of Great Britain. Probably no other European country is better adapted than our own for such schemes as the development of an electricity grid with generating stations on the coal-fields, because of the compactness of our great industrial areas, the density of their populations, and their situation on or in proximity to the coal-fields. On these points the map on p. 329 may for the most part be left to speak for itself. But it may be pointed out that the great coal-field of Durham and Northumberland is bisected by the estuary of the Tyne, to which belong the seaports which first carried on a great trade in coal, and is in immediate proximity to Sunderland and various minor ports, and that its southern end is close beside the iron ores of Cleveland in the North Riding. Further, the coal-field of Cumberland includes the seaports of Maryport and Whitehaven, besides Workington, and lies close to the iron ores of south Cumberland and north Lancashire, a rich source of iron until their virtual exhaustion. The South Wales coal-field gave rise to a vast iron industry through the fact of its having possessed great beds of ironstone, though these are now worked scarcely at all in consequence of the facility with which less refractory ores can be imported from abroad, a fact which has led to the migration of the iron centres to the coast. The North Staffordshire is now the only coal-field with an appreciable output of iron ore. In Scotland the coal-fields are likewise close to the sea, and likewise were formerly rich in iron ore. In the west of Scotland the Ayrshire coal-field extends to the ports of Troon and Ardrossan; in the Clyde basin the coal-field extends below the port of Glasgow, and the ports of Grangemouth, Alloa, Burntisland, Dysart, Leith, and others are either upon or quite near coal-fields farther east. The western coal-field supplies large quantities of splint coal, which can be used directly in the smelting of iron ores. The blackband ironstone once plentiful in parts of these coal-fields (as in Ayrshire and the Clyde



basin) yielded a very fine quality of wrought iron, which before the cheapening of steel had come to be the principal ship-building material. The ironstone also is for the most part so rich in carbonaceous matter as to reduce considerably the expense for fuel in the operations preliminary to smelting. Limestone and ganister, two other minerals of great importance in the iron industry (see p. 280), are also abundant in Great Britain, and in some cases near the beds of iron ore. In recent decades, with the exhaustion of the iron ores of the coal-fields, the chief centres of production of iron ore in England are the Midland and Cleveland districts, but the value is not proportionately great, because the ore is comparatively poor in iron, and that of Cleveland is phosphoric. It is worked near the outcrop, where it contains from about 35 to 40 per cent. of iron. The ore of Cumberland and the Furness district of Lancashire is a red hematite richer in iron, and containing very little phosphorus, and forming the only true Bessemer ores obtained in this country. Outside of the area shown in the map the hidden coal-field of East Kent, near Dover, has deposits of ironstone, and iron ores have been worked on the island of Raasay, east of Skye.

Exploratory borings have proved considerable extensions of British coal-fields under the cover of later rocks and there is no fear of the exhaustion of the coal. Reserves (including seams of 1 foot and upwards in thickness in depth down to 4,000 feet) total about 200,000m. tons, enough to last the country 800 years at the present rate of consumption. The difficulties in which the British coal industry found itself after the First World War were due in the main to two causes—the diminution of the export trade and the uneconomic working of the older collieries in the older parts of the coal-fields. Most British coal-fields to-day can be divided into two halves—the older, shallower half, partly worked out and operated by old, small units; the newer, deeper half recently developed and operated by large modern units. Good examples of the twofold division are found both in Durham and in the Yorkshire-Nottinghamshire coal-fields. This led first to schemes for the voluntary, or if that failed compulsory, ‘rationalisation’ of the industry by grouping of collieries. Later nationalisation of coal resources followed, and finally nationalisation of the industry itself under the National Coal Board.

Although the production of iron ore on the coal-fields of Great Britain is now comparatively small, among the potential iron reserves of this country are enormous deposits of low-grade clay ironstones belonging to the British coal-fields. In England these lie chiefly in the Yorkshire, Derbyshire, and Nottinghamshire field, in those of North and South Staffordshire, and the Severn coal-fields; and in Wales both in the northern field and along the northern margin of the South Wales field. The reserves of the Midland Jurassic

fields are, however, twice as great and the iron content permits economic working.

The fourth, fifth, sixth, and seventh of the advantages enumerated above on p. 327 require no special elucidation, though it may be pointed out that (5) and (6), the abundance of capital, and the advanced organisation of industry, are in part a consequence of (4), that is, of the United Kingdom having got the start of other countries in modern mechanical appliances; but this again is subject to a qualification pointed out below on p. 334, and may now be a disadvantage in that our factories are equipped with machinery now out of date but expensive to replace or too valuable to scrap. With regard to the eighth of our advantages, the nearness of the coast on both sides, it is hardly necessary to explain how this may place a manufacturing region within easy reach of many more markets than are accessible to one that has outlets only in one direction. The precise nature of this advantage is well illustrated by the trade of some of our seaports. Though Lancashire, on the west side of the Pennine Upland, has always been the great seat of our cotton manufactures, Hull frequently exported nearly as great a value of cotton yarn as Liverpool; Hull and Grimsby together much more than Liverpool; the eastern ports of Great Britain collectively always export more of that yarn than the western ports. The reason of this is that Continental nations (Germany, France, &c.) which were then among our chief customers for cotton yarn, were more easily reached from the east side. The woollen manufactures, again, are mainly carried on to the east of the Pennines, but the woven fabrics are much more largely exported from Liverpool than from any other port, though woollen yarns are exported thence only to a limited extent. The abundance of seaports, the ninth of the advantages enumerated above, is what enables the advantages just illustrated to be utilised; but it is obvious that it is an advantage also in another way, in the extent of the accommodation it provides for shipping. No doubt such accommodation can sometimes be provided artificially, as in most cases it needs to be improved artificially, but there is an enormous advantage in respect of cost where facilities are furnished by nature at a great many different points. In the British Isles there are more than twenty seaports with a natural depth of at least twenty-five feet at high water, and most of these are situated in the vicinity of the great seats of production. In view of the increasing size of the shipping of the present day this large number of deep harbours, or harbours which owing to their soft bottoms can easily be dredged, is a matter of peculiar importance to the commerce of this country.

The tenth of the advantages named above, the geographical position of the British Isles, is of great moment in more ways than one. In the first place, the 'silver streak' is a natural bulwark

of the highest value. It has long enabled the kingdom to place its chief reliance for defence upon the Navy and later the Air Force, which make a much less heavy drain upon the working population than the vast armies which Continental nations were obliged to train and keep on foot. Secondly, it is of great importance to British commerce that our islands occupy a somewhat central position among the nations that carry on a great commerce at the present day. It was of no importance to us that America lay on our west, until America began to rear a population more or less dependent on foreign commerce. In view of the three advantages specially considered in the last two paragraphs, it may safely be asserted that this country has in the aggregate greater advantages than any other area of equal extent for reaching all those parts of the world which are most conveniently reached from the seaboard. The effects of this with respect to the distribution of our own products will be understood readily enough from the illustration already given of the advantage of having seaports on different sides; and its influence on our trade in foreign goods is considered below on p. 369.

The advantages accruing to British commerce from the extent of the British Commonwealth and Empire are in a large measure indirect. The fact that throughout the Commonwealth the English language is the language of commerce is important. Since 1887 many colonial or, as they have been called since 1907, imperial conferences, have been held, in which among other matters the interests of trade have been discussed. The self-governing dominions and colonies have given preference in one form or other to imports from the mother country. In this policy Canada was the pioneer in 1898. South Africa and New Zealand followed in 1903, and Australia in 1908. The granting of a preferential tariff to the members of the Commonwealth, generally on a reciprocal basis, is now usual among the dominions and colonies themselves.

Inasmuch as fiscal policy undoubtedly affects the commercial value of local resources and place relations, it cannot be said that the discussion of the preferential tariffs between this country and the constituent parts of the Empire or the ideal of Empire Free Trade would be altogether out of place in this work; but the omission of such a discussion will no doubt be excused in view of the vastness of the subject and the fact that the relevant considerations are more economic than geographical. The whole world position is now in fact changed because of the isolation of the Soviet bloc and the dollar and sterling areas. This has already been mentioned, and is illustrated by the map on p. 121.

With regard to language, in order to realise the importance of this factor one has only to think of the rapid increase of an English-speaking population, not only in the more important British dominions and colonies, but also in the United States. In

the past century English-speaking whites, now about 8 or 9 per cent. of mankind, have increased four times as rapidly as the population of the world as a whole.

Of the economic disadvantages of this country mentioned above the deficiency of water-power is, in view of the great wealth in conveniently situated coal, a disadvantage chiefly in relation to those industries which demand the very high temperatures possible in electric furnaces. Such industries have, it may be noted, developed the water-power resources as at Kinlochleven and near Fort William. Elsewhere, in North Wales, in southern Scotland, and latterly in the north-west Highlands and the Grampians, water-power is utilised and electricity generated, the works being connected with the national grid system. The total possible annual saving of coal by the use of water-power in the United Kingdom has been estimated at a few million tons at the most and only a small fraction of the electricity generated is derived from water-power. A water-power scheme which dwarfs the greatest of the world's installations was prepared in 1920 by the Ministry of Transport. It was proposed to construct a concrete barrage, serving as a bridge for railway and motor traffic, across the Severn estuary near the Tunnel, where the channel is $2\frac{1}{2}$ miles wide. By means of a series of sluices and turbines the tides would be harnessed to develop over 500,000 horse-power during a ten-hours' day, with a peak-load capacity of over a million horse-power at a cost then estimated of just over $\frac{1}{2}d.$ per unit. Above the barrage a deep-water basin of over 27 square miles would be utilisable by the largest vessels at all states of the tide. Such an installation would, it is claimed, supply the industries of the Midlands and South Wales with a permanent supply of cheap electric power, and set free annually 4m. tons of coal previously used for generating power. Although a decision was reached after the Second World War to proceed with the road bridge, the power scheme has been shelved.

The next disadvantage mentioned, the dearness of land, may be regarded as a necessary result of the development of our industries. The third, the higher rate of wages, if considered by itself, cannot but be looked upon as a disadvantage in the struggle for cheapness into which the competition for foreign commerce in a large measure resolves itself; but it must not be forgotten that in considering the cost of labour the relative efficiency of labour has always to be taken into account. With the increase in world standards of living, the consequent rise in real wages, and international agreements on labour conditions, world differences are disappearing.

The state of technical and commercial education in this country was a few years ago a more serious disadvantage than it is now, but constant efforts in this direction are needed to bring or keep us abreast of our rivals,

The want of a decimal coinage and system of weights and measures is also felt among some as an impediment in business transactions.

In the earlier editions of *Chisholm's Handbook of Commercial Geography* he developed gradually his concepts of the advantages and disadvantages of Britain in the development of international trade. Sir Halford Mackender in his classic work *Britain and the British Seas*, first published early in the present century, likewise laid much emphasis on the importance of Britain's physical location on the earth's surface. In many ways, however, the discussion is now more of historical than current interest. It is true that the advent of the air age has again underlined Britain's favourable location, but the position which emerged after the Second World War presented many new features. One is the shortage of land—only 56m. acres in the whole of England, Wales, and Scotland of land of all types to serve the many needs of about 50m. people. The expansion of industry, housing, and the needs of recreation, transport, and defence have all cut into and are continuing to absorb food-producing land—hence the development of national land-use planning. So many countries which were once Britain's eager customers for manufactured goods are making their own, competing with us in world markets and even exporting to us. The struggle is to maintain quality and efficiency and even when that is done, British goods often face tariff barriers and currency restrictions unknown to an earlier age.

Population. Since the publication of the first edition of this work there have been six censuses of the United Kingdom, and the table below shows the rate of increase of population at these censuses of the different parts of the kingdom, as compared with the rate in 1871–81, and the most nearly corresponding figures for Germany and the United States. Owing to the war there was no British census in 1941 so that the last column refers to 1931–51. Care must be taken to note therefore that the intercensal population increase refers to twenty years, not ten as previously.

Rate of Increase or Decrease of Population per cent. per annum.

—	1871–81.	1881–91.	1891–1901.	1901–11.	1911–21.	1921–31.	1931–51.
England . . .	1.37	1.11	1.04	1.01	0.55	0.63	0.47
Wales . . .	1.12	1.11	1.22	1.64	0.84	–0.24	0.01
Scotland . . .	1.07	0.75	1.06	0.62	0.25	–0.08	0.26
Great Britain . . .	1.32	1.06	1.14	0.99	0.46	0.48	0.45
Ireland . . .	–0.45	–1.06	–0.54	–0.16	–0.34	–0.37	0.01
United Kingdom	1.03	0.79	0.95	0.87	—	—	—
	1871–80.	1880–90.	1890–1900.	1900–10.	1910–20.	1920–30.	1930–50.
Germany . . .	1.08	1.08	1.32	1.43	0.55	0.56	—
United States . . .	2.66	2.24	1.90	1.93	1.40	1.61	1.09

Distribution of Increases and Decreases of Population in the Administrative Counties (with Associated County Boroughs) of England and Wales during the Intercensal Period 1931-51

COUNTY	POPULATION 1951	PERCENTAGE INCREASE OR DECREASE	COUNTY	POPULATION 1951	PERCENTAGE INCREASE OR DECREASE
<i>Increases:</i>			<i>Increases:</i>		
<i>Over 30%</i>			<i>15-10% (cont.)</i>		
Hertfordshire . . .	609,735	+52.0	Lincolnshire (Lindsey) . . .	473,463	+12.1
West Sussex . . .	318,661	+42.9	Lincolnshire (Holland) . . .	101,545	+10.2
Buckinghamshire . .	386,164	+42.3	Derbyshire . . .	826,336	+10.1
Bedfordshire . . .	311,844	+41.4	Isle of Ely . . .	89,038	+10.1
Middlesex . . .	2,268,776	+38.4	<i>10-5%</i>		
Surrey . . .	1,601,555	+35.6	East Suffolk . . .	321,849	+9.1
Oxfordshire . . .	275,765	+31.5	Devonshire . . .	798,283	+8.9
<i>30-20%</i>			Norfolk . . .	546,550	+8.9
Berkshire . . .	402,939	+29.4	Cornwall . . .	345,612	+8.7
Flintshire . . .	145,108	+28.5	Cumberland . . .	285,347	+8.4
Kent . . .	1,563,286	+28.2	Denbighshire . . .	170,699	+8.3
Wiltshire . . .	387,379	+27.8	Isle of Wight . . .	95,594	+8.1
Worcestershire . . .	522,974	+24.5	Yorkshire (East Riding) . .	510,800	+5.8
Huntingdonshire . .	69,273	+23.2	Northumberland . .	798,175	+5.5
Peterborough (Soke of) . . .	63,784	+23.0	<i>Under 5%</i>		
Dorsetshire . . .	291,157	+21.6	Pembrokeshire . .	90,896	+4.2
Warwickshire . . .	1,860,874	+21.4	Yorkshire (West Riding) . .	3,585,402	+4.0
<i>20-15%</i>			Anglesey . . .	50,637	+3.3
Lincolnshire (Kesteven) . . .	131,566	+19.4	Westmorland . . .	67,383	+3.0
Cambridgeshire . . .	166,863	+19.2	Caernarvonshire . .	124,074	+2.7
Gloucestershire . . .	938,618	+18.7	Lancashire . . .	5,116,013	+1.5
Shropshire . . .	289,844	+18.7	<i>Decreases:</i>		
Nottinghamshire . .	841,083	+18.0	<i>0-5%</i>		
Southampton . . .	1,196,617	+18.0	Durham . . .	1,463,416	-1.5
Rutlandshire . . .	20,510	+17.9	Monmouthshire . .	424,647	-1.6
Somersetshire . . .	551,188	+17.2	Brecknockshire . .	56,484	-2.2
Leicestershire . . .	630,893	+16.5	Glamorganshire . .	1,201,989	-2.2
Essex . . .	2,043,574	+16.4	Cardiganshire . . .	53,267	-3.5
Northamptonshire . .	359,550	+16.2	Merionethshire . .	41,456	-4.0
Cheshire . . .	1,258,050	+15.7	Carmarthenshire . .	171,742	-4.1
<i>15-10%</i>			<i>Over 5%</i>		
Herefordshire . . .	127,092	+13.7	Montgomeryshire . .	45,989	-5.1
West Suffolk . . .	120,590	+13.6	Radnorshire . . .	19,998	-6.2
Staffordshire . . .	1,621,013	+13.0	London . . .	3,348,336	-23.8
East Sussex . . .	618,083	+13.0			
Yorkshire (North Riding) . . .	525,496	+12.6			

It will be noted that the leading percentage increases are not in the big mining and industrialised counties, though actual decreases are confined to Durham, various Welsh counties, and the County of London. London and the industrial areas were the special target of war bombing, and the exceptional rate of decrease in the population of the County of London was partly due to the resulting devastation. But the exodus from the county into the surrounding country of Greater London has been operative and progressive since the beginning of the century, and is one cause of the rapid increase of population in neighbouring counties. Other factors in the changing distribution of the population are discussed on the next page.

This table is sufficient to indicate the general trend of population. The pre-1914 moderate increase in Britain (with an absolute decline in Ireland) gave place to a slight increase in Britain as a whole but an absolute decline in Scotland and Wales. Actually this was rural depopulation, and the actual or relative decline applied to rural counties of England as well. The increase was mainly in the main manufacturing belt of Britain—an area stretching from Manchester to London which had more than 57 per cent. of the people of the country.

The changes in the period 1931–51 show an increase in all parts of the United Kingdom. This is in part due to an influx of political refugees from continental Europe, notably Poles and Austrians. The decline in Wales was checked and even the absolute decline in the Irish Republic has been reversed.

It will be seen from the figures of the United States that population there is still increasing at a comparatively rapid rate, despite the slowing down of immigration.

Urbanisation of Population. In common with most countries of the world Britain has continued to show rural depopulation and urban expansion. Official figures of 'rural population' refer to persons living in Rural Districts which may in fact include towns of considerable size. Persons living in farms, scattered rural habitations, and in villages in fact number only about 10 per cent. of the population, including the 5 or 6 per cent. actually engaged in farming. As farming has become more efficient through mechanisation and in other ways, the same output is possible with a smaller labour force whilst improved transport enables the farmer to seek his outside requirements in the neighbouring town instead of the village store. The resulting rural depopulation threatens the whole social structure as evidenced by the closing of village schools and amalgamation of village churches. On the other hand, as the table on p. 373 shows, the towns have continued to grow—except some of the older industrial centres or those in remoter or peripheral areas. The growth of Greater London and Greater Birmingham constituted a threat to efficient organisation and the dispersal rendered imperative by bombing during the Second World War is now regarded as a proper objective of planned location of industry. Manufacturers are encouraged by the grant of licences to go to the areas, usually the older or peripheral industrial areas, scheduled for development, and new towns are being built to encourage movement away from London and other urban centres which are regarded as having grown too large. The table overleaf shows this trend.

British Industries. The local distribution of British manufacturing industries presents many points of interest, some of them purely geographical, some historical. In the case of one of the greatest of these industries, that of cotton, it is a noteworthy fact

that it is almost wholly confined to a few localities in the west of Great Britain. In England the spinning and weaving of cotton are almost restricted to the west side of the Pennine Upland, mainly to that part of Lancashire which lies to the south of the Ribble; in Scotland, to Glasgow and other manufacturing towns in the west. The reason for this distribution is geographical. In the Middle Ages the local supply of wool from the Pennine sheep gave encouragement to a crofter's industry of spinning and weaving. The local soft waters were suitable for scouring and dyeing and later the water-power from swift streams came to be used. Liverpool grew as a port with the 'trade triangle' and the new textile material cotton was naturally introduced here to a community already skilled in the processes of spinning and weaving. The humid climate of the western side of the Pennines proved peculiarly favourable, whilst with the coming of the industrial revolution there was coal present in abundance. Both for the spinning and weaving of cotton a moist climate is of considerable importance, and in districts where the manufacture is carried on, dry weather, and especially cold and dry weather, adds considerably to the expense of the operations; for where the air is too dry the yarn is liable to become brittle through losing its natural moisture, and all the more likely is this to result when, as on cold days, the temperature of the spinning-'mill' or weaving-'shed' is much above the temperature of the air outside. The failure of cotton factories started in other parts of England has been attributed in some cases to no other factor. Even the shelter of a hill against dry east winds is considered a matter of high pecuniary value. It may be however that the importance of this factor has been overemphasised: soft water for dyeing and other operations is even more important.

In England the town most closely associated with the cotton industry is Manchester. This is one of those towns which owed their original importance in a large measure to the fact of their lying in a plain just on the border of hill country, a position which, as already explained, naturally leads to the convergence of roads from many parts of the plain as well as from one or more valleys among the hills. It is hence natural to find that a town has been situated in this position from a very early date. Manchester (the ancient Mancunium) was already in existence in the time of the Romans, and in the early part of the fourteenth century it became known as a manufacturing town through the settlement of Flemings here. But the first materials of its textile manufactures were wool, a local product, and linen yarn obtained from Ireland. It is uncertain when cotton was added to these, and though Manchester 'cottons' are spoken of even in the fourteenth century, it was not till long after that pure cotton fabrics were made there, or anywhere else in England. Since the great inventions of the eighteenth century

Manchester has grown with the cotton industry, the trade in cotton goods and yarns having always been centred here. In 1774 Manchester and Salford together had a population of little more than 27,000; at the census of 1801 the joint population of the two townships had risen to 84,000. In 1891 the population within a radius of twelve miles of Manchester Exchange was upwards of 1,600,000, in 1921 it was over 2,200,000 and in 1931, 2,300,000. In 1951 the census returns gave the population of the conurbation as 2,421,000. In the course of time Manchester has become the commercial and business centre of the group rather than the chief manufacturing town.

Among the surrounding towns engaged in the cotton industry are Oldham, Bolton, Bury, Rochdale, and other towns which have enriched the bleak Lancashire moorlands to the north and east of Manchester; Stockport and Hyde in Cheshire to the south, and Glossop in a Derbyshire valley south-east of Manchester: all situated on the great coal-field west of the Pennine Upland; and farther north are Preston, Blackburn, Accrington, and Burnley, all Lancashire towns, and the last three likewise situated on the same coal-field. Oldham and Bolton are the two towns most noted for cotton-spinning mills, the former being engaged chiefly in the production of medium yarns, the latter of the 'higher counts.' The northern towns of Burnley, Blackburn, Preston, Nelson, and Accrington, all situated along the route of the railway from Preston to Skipton, take the lead in cotton-weaving. All these towns are on the northern margin of Rossendale Fells, a spur of the Pennine Upland, some at a level of about 500 feet. Wigan, though it is also a cotton-manufacturing town, is notable chiefly as the principal centre of the coal-trade in Lancashire. In 1900 there were no fewer than thirty-five towns in South Lancashire and the parts immediately adjoining which had at least 100,000 spindles engaged in this industry, Oldham heading the list with nearly 12m. and Bolton following with 5m. In the heyday of the cotton industry, in 1914 the number of spindles belonging to the Oldham federation was 19m., to that of Bolton, 9m. In face of the competition of Japan, India, and many other countries, the relative and actual importance of the cotton industry has declined. Some mills have switched over to rayon, nylon, and other fibres.

For its supplies of raw cotton the great cotton manufacturing region of England is still dependent mainly on Liverpool, but direct shipments of cotton now come to Manchester by means of the ship-canal constructed between 1887 and 1893 and opened for traffic on the first day of 1894. It extends from Eastham on the south side of the Mersey to the heart of Manchester, has a total length of $35\frac{1}{2}$ miles, and a minimum depth of 28 feet. The entrance locks at Eastham have been reconstructed to admit tankers of up to 30,000

tons, and the bottom width of the canal at the full depth is, with a few exceptions, 120 feet, which is sufficient to allow of large ships passing one another, and at the bend at Runcorn the width has been increased to 175 feet. The port is provided with graving docks, large grain elevators, oil-tanks, cold storage accommodation, and other modern equipment. The trading estate known as Trafford Park has encouraged the development at Manchester of diversified industries. The traffic of the port, which includes Warrington and Runcorn as well as the later developments at Ellesmere, Irlam and Stanlow, has grown steadily and rapidly. In the case of the Manchester Ship Canal it has also to be borne in mind that its whole length is laid through a part of the busiest industrial region of England, so that it may be looked upon as destined to form a double line of quays with a total length of 70 miles. In 1894 the total value of the trade of the port was £6.9m. (about 40 per cent. imports), in 1929 it amounted to £69.5m. (90 per cent. imports). By 1948 the total was £208.7m. (66 per cent. imports). In 1948 it ranked third among the ports of Britain. The total capital expenditure on the canal down to the end of 1913 was nearly £17m. The first dividend on the preference stock belonging to the Corporation of Manchester ($2\frac{1}{2}$ per cent.) was not however paid until 1915. In 1926, $3\frac{1}{2}$ per cent. was paid on the Manchester Ship Canal Corporation stock, 5 per cent. on the Preference and Ordinary Shares of the Company. This great venture thus took thirty years to establish itself.

As the nature of the case renders the growth of the port of Manchester of peculiar interest some details are given in the table overleaf. It is important to note that much of the trade attracted to Manchester is destined in fact to the many factories now extended along the length of the canal.

It will be observed that petroleum, an article of comparatively small value in proportion to its bulk, an article largely conveyed in special ships, is the commodity in which the trade of Manchester and the canal has grown most rapidly to the prejudice of that of Liverpool. In paper-making materials we have another bulky article, and in relation to it we have to consider the situation of the mills, and with reference to that again the situation of the streams supplying the water and that of the consumers of the product. Raw cotton was for long the most valuable of the articles imported at Manchester. The growth of that import as compared with the corresponding import at Liverpool was for a considerable period steady, though slow. It shows the difficulty of displacing an old market requiring a high degree of organisation. The hold which Liverpool retains on the export trade of cotton tissues is not surprising to anyone who considers the widespread distribution of the markets for these products, and the relations of the chief weaving

towns to the ports of Liverpool and Manchester respectively. Among later developments, all illustrative of the influence of an enormous consuming population in the immediate neighbourhood, may be mentioned the import trade in frozen meat, wool, and tea. The first large cargo of wool from Australasia reached the port in July 1916, and large provision was later made for this trade.

PRINCIPAL ARTICLES OF TRADE OF THE PORT OF MANCHESTER. PERCENTAGE OF THE TOTAL TRADE OF THE UNITED KINGDOM IN THE ARTICLES NAMED AT LIVERPOOL (L) AND MANCHESTER (M) BY QUANTITY.

IMPORTS.							
—		1893.	1894.	1906.	1912.	1935.	1951.
Raw cotton	{L	92.3	90.5	77.7	79.3	65.7	65.6
	{M	—	1.6	16.6	16.6	33.4	28.5
Paper-making materials	{L	10.8	10.4	3.0	1.8	0.6	3.2
	{M	—	4.1	14.3	10.9	9.7	12.2
Wood, sawn and hewn	{L	9.2	8.2	6.6	8.4	26.3	27.4
	{M	—	1.2	5.6	5.2	4.5	1.9
Manganese ore	{L	—	—	20.6	20.3	21.3	41.6
	{M	—	—	7.3	10.3	6.0	1.7
Petroleum	{L	22.4	19.9	9.9	8.3	6.9	4.3
	{M	—	0.3	12.1	9.8	13.0	13.4
Wheat	{L	28.9	25.3	25.6	23.0	19.0	19.7
	{M	—	0.1	5.3	7.8	10.2	6.4
Maize	{L	25.0	24.9	22.9	17.7	25.7	23.9
	{M	—	0.1	2.4	2.4	4.1	4.0
Bacon and hams	{L	63.3	61.7	51.4	34.9	10.5	0.2
	{M	—	—	1.9	1.2	1.9	0.5
EXPORTS.							
Cotton tissues	{L	75.9	73.2	69.0	66.2	67.8	67.3
	{M	—	3.6	9.1	12.3	7.2	4.2
Cotton yarn	{L	39.4	35.7	34.2	31.2	34.9	43.9
	{M	—	17.2	22.2	25.2	15.5	9.9
Woollen and worsted tissues	{L	48.2	40.3	57.2	32.1	37.4	35.5
	{M	—	0.5	2.6	3.5	4.0	7.5
Machinery, &c.	{L	34.3	31.2	32.4	32.9	38.8	38.1
	{M	—	2.1	5.1	5.6	3.9	4.3

At a distance from the Manchester district the only large town in which cotton manufactures form the staple industry is Nottingham on the Trent, in which certain branches of the manufacture, that of cotton hosiery, and the making of machine-made net and face, the latter less important than formerly, have their chief seat.

In Scotland, though cotton manufactures are carried on very largely, the only town whose name is specially associated with a branch of this industry is Paisley, in Renfrewshire, where the manu-

facture of cotton thread has its chief seat. The cotton fabrics mostly made in Scotland are very fine lawns, muslins, and certain kinds of figured and coloured dress goods.

The West Riding of Yorkshire—the area of the West Riding coal-field—is for the **woollen industry** of Great Britain much what Lancashire is for the cotton industry, though this section of the textile manufactures of the country is not so restricted in its range as the other. The principal centre of the trade of this region is Leeds, which occupies a situation geographically very similar to that of Manchester—just off the Pennines, a business centre with a surrounding ring of manufacturing towns.

Leeds stands on the Aire amidst the gently undulating country that lies between the broad flat Vale of York and the narrow dales on the west. It thus has free communication with the north, east, and south-east, and on the west it commands two principal lines of communication, one by the valleys of the Calder and Colne to Manchester and South Lancashire, the other by the valley of the Aire to Mid-Lancashire. Like Manchester, it is a very old seat of trade and manufacturing industry. It is described by Camden (1607) as ‘much enriched by the woollen manufacture,’ and nowadays, while still retaining its importance in the woollen trade, it has added to that many other important industries. It is the commercial centre of the woollen trade rather than a manufacturing centre. Besides being the chief centre of the wholesale clothing trade in the country, it probably stands first also in the leather trade, and has considerable iron and steel manufactures.

The narrow dales of Yorkshire to the west of Leeds are filled with larger or smaller manufacturing towns engaged in the woollen industry. In some of them its origin belongs to as remote a date as in Leeds itself, these dales ‘well supplied with water, fuel, and cheap provisions,’ and surrounded by sheep pastures yielding a fine lustrous wool, having been among the localities to which the woollen industry migrated at the close of the Middle Ages, when the expense of living hindered its prosperity on more ancient seats nearer London. In Wakefield and Halifax as well as in Leeds foreign artisans were settled by Henry VII in 1489, and a generation later Halifax was already noted for its products in this branch of manufacture. When modern machinery was introduced the abundance of coal in the region served to stimulate the industry in those valleys still further, and many of the towns now engaged in the manufacture date their rise only from that period.

At the present day the centre of all branches of the worsted manufacture is Bradford, which is situated in a small basin among the hills to the west of Leeds and a little to the south of the Aire. Here the primary advantage seems to have been abundance of pure water suitable for the scouring of the wool, an advantage which the

corporation of the town took care to preserve as the industry increased. The worsted industry is another of those industries in which the abundance of capital is of peculiar importance. The combing of the wool is a highly specialised industry involving the use of complicated machinery, but employing mainly the labour of girls. Accordingly, to be carried on economically it must be on a large scale. Bradford has likewise large silk, velvet, and plush mills (in which the raw material used is or was *schappe* or spun silk) —and close beside it on the Aire itself is the model town of Saltaire with its great alpaca works. Halifax in the Calder valley is known for its lighter worsted fabrics, its baizes and carpets. Huddersfield on the Colne, a tributary of the Calder, though not even mentioned by Camden, is pre-eminent in the manufacture of high-class fancy goods as well as plain fabrics. Dewsbury and Batley manufacture heavier fabrics, including blankets and shoddy. Wakefield, Barnsley, Keighley, Morley, Heckmondwike, and many others in this area are engaged in some branch of the great industry. Even on the west side of the Pennine Upland there are some towns that still carry on their old woollen manufactures. Rochdale has flannel mills, and Bury, Ashton, and Glossop all manufacture woollens of some kind; Denton and Stockport have felt hat factories.

The district in the west of England that early became known for its 'cloths' as distinguished from the 'stuffs,' for which the bulk of English wool was best adapted, still retains something of its renown in connection with this manufacture, and especially for the making of broadcloth. In some of the towns in which the industry was formerly pursued it has died out, but it still flourishes at Stroud in Gloucestershire and in the Stroud valley generally, and at Bradford and Trowbridge in the west of Wiltshire.

In the far north it is interesting to note that Kendal still retains something of the industry for which it was already known before the close of the fourteenth century, but in the east of England, where numerous towns were once noted for their woollen or worsted goods, even Norwich has lost nearly all its textile industries, although in virtue of the advantages due to its central situation in a fertile part of the country and to its still being accessible by sea, it continues to carry on important manufactures of one kind or another (mustard, starch, boots and shoes, agricultural implements, &c.).

Leicester, throughout its history as a manufacturing town, has been the chief seat of woollen hosiery in England, which was originally no doubt in a large measure due to the fact that the Leicestershire breed of sheep yields one of the finest wools for the making of worsted yarn, and more recently to its lying near a coal-field. The making of lace and elastic webbing has been added to its textile industries. Kidderminster in Worcestershire and Wilton in Wiltshire were for long celebrated for their carpets; but it is to be noted that

'Brussels' carpets became the speciality of Kidderminster and the so-called Kidderminster carpets are made chiefly in Scotland and the Yorkshire woollen districts.

In Scotland woollen manufactures form the staple industry mainly in certain towns in the basin of the Tweed—Hawick and Jedburgh, Galashiels, Selkirk, and Innerleithen—which are chiefly noted for the kind of fabric appropriately known as tweeds, in the making of which, however, they now have a rival in Dumfries, as well as in many of the Yorkshire manufacturing towns. The prosperity of some of these towns was greatly promoted at one time by the abundance of water-power afforded by the streams, but nowadays this source of power is not much used, and the continuance of the industry in the district is all the more striking from the fact that it lies remote from any productive coal-field. Though the counties of Roxburgh and Selkirk are said to carry more sheep per acre than any other part of the world, and this fact must have contributed greatly to the origin of the industry, the local supplies of wool no longer meet a tenth of the requirements. Besides tweeds, woollen hosiery is a large manufacture of this district. Of the two most important of the manufacturing towns mentioned, Galashiels and Hawick—both situated on one of the lines of railway from Edinburgh to Carlisle, Galashiels at the point whence a branch runs up the Tweed valley towards Glasgow—Hawick is specially devoted to this latter branch of the woollen industry. Hosiery is largely manufactured also at Dumfries, Edinburgh, and elsewhere, and carpets and other woollen goods are made at Glasgow, Ayr, Kilmarnock, Edinburgh, Perth, and Stirling. In general it should be noted that the woollen and worsted goods manufactured in all the outlying parts of the United Kingdom are of relatively high value, in the production of which local skilled labour compensates the lack of other advantages enjoyed by the West Riding.

The great textile industry of Northern Ireland is, as it long has been, that of **linen**. The manufacture is now nearly confined to Belfast and the district around. In this district it first received an important stimulus at the end of the seventeenth century through the settlement of some Huguenot families, after the revocation of the Edict of Nantes, at Lisburn on the Lagan above Belfast. The linens of Belfast and the neighbourhood include those of the finest quality, and one great advantage enjoyed by the district for the production of such goods is the excellence of the spring water used in bleaching. For the finest linens flax is imported from Belgium, but large quantities are or were formerly also imported from Latvia, Estonia, Russia, as well as from Holland. In Scotland the chief centre of the linen manufacture is or was Dundee, but there, as well as in several eastern towns, it was chiefly the coarser linens that were manufactured, the raw material coming from Baltic

countries. This branch of industry has been mainly carried on in Scotland north of the Firth of Tay since the eighteenth century, and its predominance in those parts may perhaps be ascribed to the fact that the ports of that part of the country are the first reached by ships that round the north of Denmark. Dunfermline, in the west of Fife, has been noted for its damask table-linens since the early part of the eighteenth century. In England linen is an important industry in Manchester.

Jute yarns and fabrics, including hessian and sacks, though mainly exported from London, Liverpool, Glasgow, and other ports which carry on most of the foreign trade, are still manufactured most largely at Dundee, where the industry was first introduced in this country. In England, it has considerable importance at Barnsley. The raw material comes almost entirely from Bengal but the bulk handling of grain and use of paper bags have cut into the trade.

The **silk industry** of the British Isles is almost confined to England, and is still pursued principally in the district where it was first firmly established, Derbyshire and the neighbouring parts of Staffordshire and Cheshire, where the streams furnish pure water, an important requirement of this manufacture. Derby, Ilkeston, and Chesterfield in the first-named county, Macclesfield and Congleton in Cheshire, Leek in north Staffordshire, are among the towns chiefly engaged in this pursuit. Leek is specially noted for its sewing thread and its silk-dye works, the water of the neighbourhood being among the best dyeing waters of Europe. Silks of one kind or another are also made in many other places. Coventry, once noted for its ribbons, now carries on an industry in artificial silk, though most of the woollen, cotton, and knitwear towns also engage in manufactures in artificial silk. The industry was introduced by the Huguenots into London, and the manufacture of silk was for long carried on there in Spitalfields and Bethnal Green.

The products of the various textile industries of which the chief seats have just been indicated made up (if we include apparel, millinery, &c.) in the period 1911-13 nearly 40 per cent. of the total value of the British exports of native produce and manufactures. Then followed a steady decline—to 37 per cent. in 1924, 25 per cent. in 1931, and 15 per cent. in 1952. Next came iron and steel and their products, which, if we include among them steam-engines and machinery of all kinds, hardware and cutlery, made up in the period 1911-13 very nearly 20 per cent. of the exports of the United Kingdom—in inter-war years more. Metals, manufactures therefrom and engineering products in 1952 represented 52 per cent. by value of all British exports.

The chief seats of **iron-smelting** are at and round Middlesbrough in the North Riding of Yorkshire; in north Lancashire and Cumberland at Barrow, Workington, and other places supplied

with red hematite from the neighbouring deposits; in Lincolnshire, especially north Lincolnshire (Frodingham and Scunthorpe), Northamptonshire (Corby), and south Staffordshire; in the West Riding of Yorkshire; in South Wales near Port Talbot, and other places (though the inland industry is almost extinct except for modern steel works at Ebbw Vale); in Lanarkshire, at Airdrie, Coatbridge, and other places in the basin of the Clyde, and in north and east Ayrshire and at Falkirk (Carron works in the Forth basin). Unfortunately the Cumberland coal was not found generally suitable (until recently) for iron-smelting, and most of the fuel had to be brought to this district from the east in the form of coke, from as far away as 75 to 100 miles. Both Cumberland and Lanarkshire have become largely dependent on Spanish and African ores.

The towns and seaports of Barrow and Middlesbrough have both risen into importance since about the middle of the nineteenth century through the working of the iron ores in their vicinity. The hematite ore near Barrow was held in high repute long before facilities existed for working it on a large scale. These facilities were first provided by the opening of a short line of railway from the quarries to the coast. Furnaces and ironworks rapidly rose up, and an excellent harbour was simply formed by the enclosure of the channel between the mainland and the small island opposite. Middlesbrough, which is situated on the south side of the Tees, and accordingly in Yorkshire, owes its rise to a bed of iron ore, previously discovered in the valley of the Esk, near Whitby, being traced in 1850 to the vicinity of the present town. The situation of Middlesbrough being convenient for obtaining supplies of coke from north Durham and the Tyne, and of limestone, which crops out on the surface within a distance of 40 miles to the north-west, thus presented all the conditions for the establishment of a great iron industry. To make it at the same time a great seaport all that was necessary was to dredge the estuary of the Tees to a depth sufficient to admit large vessels, and to create a harbour protected from the waves of the North Sea. Both of these objects were accomplished, the latter by the construction of a breakwater, the material of which consists of the scoriæ from the neighbouring blast-furnaces. The ores for the iron industry of South Wales and Monmouthshire are now mainly of Spanish or African origin. The ports of Newport, Cardiff, and Swansea receive a large proportion of the iron ore imported into the United Kingdom, but this commodity also comes in large quantity to Glasgow and Ardrossan, Middlesbrough, and the Tyne ports.

The relative decline of the inland iron industry of the United Kingdom, reveals not only the exhaustion of the coal measure ores formerly used but the effects of overseas competition necessitating the concentration of the industry where physical factors are favour-

able. In keeping with this, we find a tendency in the iron industry to become concentrated in the maritime centres of production, a fact which serves at once to illustrate the advantage that Great Britain owes to its easily reached seaboard. Ironworks in the West Riding of Yorkshire, in Staffordshire, in Shropshire, and around Merthyr Tydfil in South Wales have been transplanted to the coast. Another effect of the keen competition in this industry was an agreement under which the articles of iron and steel mostly used in engineering are produced in large quantity in standard sections, and a great economy thus secured in their production. The leading British purchasers of such articles agreed to order only the sections fixed by a committee appointed for the purpose. This favours the production of such articles at rolling-mills in the neighbourhood of the blast-furnaces, but the situation of iron and steel manufactures of a more advanced kind is influenced by other circumstances.

In connection with the manufacture of articles made from iron, two towns in England are specially noteworthy—Birmingham and Sheffield, both being towns which became engaged in the working of metals at a very early date, and have grown to a large size through the prosecution of such industries down to the present day.

Birmingham lies almost exactly in the middle of the low plateau between the rivers Trent, Severn, and Avon. The surrounding forests, together with abundance of iron ore in the neighbourhood, seem to have determined the form of the industry which grew up here. The smiths of Birmingham are mentioned as early as 1538. Under the name of Bremicham the town is described by Camden in 1607 as 'swarming with inhabitants, and echoing with the noise of anvils.' In 1727 its iron and hardware manufactures were estimated to employ or support upwards of 50,000 people. The local iron ore is no longer used; the 'Black Country' is no longer a country of blast furnaces belching forth smoke by day and lighting the sky with a lurid glare by night. But the heavy iron and steel industries have given rise to a great variety of metal manufactures especially of articles of small size. Birmingham and the whole of the adjoining parts of south Staffordshire, Worcestershire, and Warwickshire are crowded with large and small towns, Wolverhampton, Walsall, Wednesbury, West Bromwich, Dudley, the inhabitants of which are all mainly engaged in similar occupations—the making of all kinds of articles in metal as well as other goods especially associated with the supply of food and domestic articles to the large local population of 1½ millions. All kinds of domestic ironmongery are the chief products of this district, but motor-cars, engines and machinery, as well as needles, pins, and buttons, are also important articles of manufacture. Bromsgrove, Redditch, and Stourbridge in Worcestershire belong to the same group of towns in respect of the nature

of the industry which they carry on. Redditch is the most important place of manufacture of needles in the world.

In all those regions where there are heavy industries relying on male labour there results a surplus of female labour. Consequently, light industries tend to become established in the same areas to absorb this female labour. The food industries of Birmingham (e.g. chocolate at Bournville) may be noted in this connection. Another good example is afforded by the corset-making industry of the dockyard town of Portsmouth.

Sheffield lies at a junction of valleys in the extreme south of Yorkshire. The neighbourhood supplies both coal and iron (as well as water-power and excellent grindstones) long used in the making of cutlery, including fine cutting tools and the best tool-steel. A great stimulus was given to this industry by the discovery in 1740 by Huntsman, a Sheffield cutler, of the improved method of making cementation or crucible steel. But since the introduction of the Bessemer process of steel-making here in 1858 Sheffield has become the seat of steel industries on a much larger scale, making ships' plates, armour-plates, tyres and axles, ordnance, and all kinds of steel castings and forgings. For the finest work it has for hundreds of years imported the best raw material from Sweden. Local water-power is no longer used, nor are the grindstones; there is no local iron ore but the momentum remains.

Many other towns in England are known chiefly in connection with one or more branches of the iron and steel industry. The making of rails is a rolling-mill industry naturally carried on in the neighbourhood of the blast-furnaces, and especially those favourably situated for export, as at Middlesbrough and Barrow. Warrington, on the Mersey in Lancashire, produces iron wire, &c. The making of tin- and zinc-plate, a highly specialised industry of old standing and working partly for export, is concentrated especially at the industrial towns, and especially seaports, of the western end of the South Wales coal-field (Swansea, Llanelly, and Neath). The making of machinery for textile manufactures is carried on mainly, if not wholly, in some of the towns in which these manufactures form the staple industry. Cotton-spinning and weaving machinery is made at Manchester, Oldham, Bolton, Blackburn, Burnley, Bury, and other towns in the cotton-manufacturing district. In the same way machinery for the woollen industry is made in the woollen towns of Yorkshire—Leeds, Huddersfield, Bradford, and Keighley. Machinery for the manufacture of hosiery and other knitwear is made at Leicester and Nottingham.

Steam-engines and railway-carriages are made at Manchester, Leeds, Birmingham, Glasgow, Newcastle, Darlington, and several smaller towns, where long before the nationalisation of 1948 the different railway companies established such works for their own

lines. The former London, Midland and Scottish Railway had establishments of this kind at Crewe and Derby, the Great Western at Swindon in north Wiltshire, the Southern Railway at Eastleigh, near Southampton, and Ashford, the London and North-Eastern Railway at Doncaster, Darlington, and Gorton. In the selection of such places the companies were obviously guided by the desire to find a place on their own lines where land was cheap, rather than places in the vicinity of coal and iron supplies, which they can carry themselves at a minimum of cost.

Agricultural machinery and implements are made in many towns belonging to the corn-growing districts, as at Lincoln, Grantham, Gainsborough, Norwich, and Ipswich. These are all towns near the chief home market, sufficiently large to have convenient means of transport, and sufficiently small for land to be obtainable at a reasonable rate for the large areas required for such works. Chelmsford, Ipswich, Preston, and other seaports are becoming increasingly important as engineering centres, including electrical engineering.

An industry which has increased very rapidly in importance in recent years is the motor industry. In 1908 there were 65,000 cars and vehicles registered in Great Britain; in 1922, 552,000; whilst in 1926 the million mark was reached. By 1935 the total exceeded 2·1m., representing one motor vehicle for every 18 persons (compared with 1 per 3·5 persons in the United States). In 1950 the vehicles registered reached 4·3m. vehicles or about one vehicle per 11 persons. A little over half were private cars. In 1908 12,000 motor vehicles were manufactured in the United Kingdom; in 1925, 153,000. In 1952, nearly 700,000 were manufactured and 440,000 exported. In 1925 a quarter of a million were employed in the industry, ten years later nearly half a million. The industry is centred in the south-west and south-east midlands of England, especially at Coventry (where it has evolved from the earlier manufacture of bicycles), Birmingham, and Oxford. During the Second World War the industry turned over to wartime needs and many works were engaged in the manufacture of aero-engines and aeroplanes—notably at Coventry and Derby. The export of motor-cars became very important in post-war years and the home market remained unsatisfied with five million vehicles registered in 1952. When the Ford Motor Company of Great Britain was expanding its output, it deliberately moved from Manchester to London. Near the northern banks of the Thames in Essex great works were developed—blast furnaces making iron, steel works, motor-car and tractor factories are all found as an integrated whole on one continuous site at Dagenham, and a new town, albeit a suburb of London, has grown up. The industry is remarkable for the extensive use of electrical power. Closely connected with the motor industry is the rubber industry. The consumption of rubber in the United King-

dom was about 75,000 tons in 1929, 100,000 tons in 1936, and 220,000 tons in 1950.

Not very many generations ago the Thames was the chief seat of shipbuilding in Great Britain, and it was the change from wood to iron as the material for that industry that transferred the industry to the Clyde and other northern rivers. Clydeside is now the chief seat of shipbuilding in the world—of shipbuilding in all its branches, including the making of marine engines. Shipbuilding yards succeed one another for miles below Glasgow, and are met with at other places lower down, especially at Dumbarton and Greenock. Next to the Clyde in shipbuilding come the Tyne, the Wear, the Tees, and the Hartlepoons and, in Ireland, Belfast. To a less extent the industry is carried on at Hull, Liverpool, Barrow-in-Furness, Dundee, &c. There are government dockyards at Chatham on the Medway, at Portsmouth and Devonport, and at Rosyth in Fife-shire, on the north side of the Firth of Forth just above the Forth Bridge. Ship-repairing is a distinct industry for which there are special facilities at the ports of the Tyne, London, Southampton, and Liverpool.

Important among British exports of native produce and manufactures comes copper, with the various articles made out of that metal. As far back as the time of Queen Elizabeth, Swansea had a large business in the smelting of copper ores brought from Cornwall and Devon, the only English counties where this metal was found in great abundance. This business still continues, but nowadays not only copper ores, but also those of silver, zinc, lead, and sulphur, are brought hither from all parts of the world to be smelted, and more or less of the resulting metal is re-exported as British produce. Llanelly, in Carmarthenshire, shares in the industries of Swansea. In the making of articles from copper alloys, brass, bronze, &c., Birmingham takes the first place, as it does in all kinds of hardware; but Rotherham, on the Don, besides being an iron town is also noted for its manufacture of brass.

Metalliferous mining is almost dead in Britain: copper and tin ores were worked mainly in Cornwall and Devon. Only the best tin mines are still able to stand the competition of Malay or Nigerian tin. Lead was obtained most abundantly in the Isle of Man, the west of Durham, and other northern and central districts. The district round Wirksworth in Derbyshire has been worked since pre-Roman times. In many years the total value of metalliferous ores, other than iron, raised in Great Britain has been less than £1m.

The making of earthenware and porcelain is another industry which involves a great consumption of fuel, and is hence carried on in this country mainly in coal-yielding districts. It is explained elsewhere (p. 302) why the making of the greatest variety of earthenware has come to be carried on mainly at Stoke-on-Trent in north

Staffordshire, a county borough in which are now incorporated the former 'pottery' towns of Burslem, Tunstall, Hanley, Fenton, and Longton, as well as Stoke. Worcester and Derby have long been noted for their porcelain. Stourbridge makes a very hard kind of stoneware from fireclay found in the neighbourhood.

Glass also is made, for the same reason, chiefly on or close to the coal-fields, at St. Helens in Lancashire, where there are excellent glass-making sands, at Birmingham, at Dudley and Stourbridge in Worcestershire, at South Shields, at Glasgow; glass bottles at Castleford, Doncaster, Rotherham, and other places in Yorkshire. As common salt is the chief material used in the making of 'alkali,' this product is largely made in the chief salt-yielding districts of England. Of these the most important was long that in the valleys of the Weaver and Wheelock in Cheshire, with the towns of Northwich, Middlewich, Winsford, and Sandbach, Droithwich and Bromsgrove in Worcestershire. More recently the great focus is formed by the towns on both sides of the Tees (Billingham, Haverton and Port Clarence in Durham, Middlesbrough in Yorkshire). There are other works in north Lancashire (at Preesall, near Fleetwood, and on Walney Island), at Stafford, and elsewhere. The other seats of the alkali works of the country are Widnes, at the head of the estuary of the Mersey, on the Lancashire side, and Flint, both near the Cheshire salt district; and works of the same kind exist on the south Durham salt district, at South Shields, also at St. Helens, Swansea, &c. The great manufacture of dyestuffs which sprang up after the cutting off of German supplies in the First World War has its principal seats on waterways—on the Thames, at Silvertown and elsewhere, on the Mersey and the Manchester Ship Canal, at and near Huddersfield, at Grangemouth on the Firth of Forth. The geographical distribution of the chemical industries has been profoundly influenced by the amalgamation of all the chief producers as the Imperial Chemical Industries, Limited, one of whose main centres is the new town of Billingham-on-Tees, where there is also a huge plant for making petrol from coal. The chemical industries have been described as the 'most married' of all the industries, since their products—dyes, bleaching agents, acids, and so on—are required by a great variety of other industries; hence the emphasis on transport.

Ardeer, near Irvine, one of the most important early centres in the country for the manufacture of explosives, is on a site deliberately chosen on a sandy foreshore, because while near a seaport the sand-dunes afforded a natural isolation for the different works of this dangerous industry. There are other sites of a similar type, many developed during the Second World War.

A few of the British industries in which a cheap supply of coal is of less importance than other requirements may now be noticed.

In the manufacture of paper a supply of pure water is for the most part essential, and hence this industry is mostly carried on in districts that still contain pure streams and at spots not far from the great markets (large towns). The vast quantities of cheap bulky material used in the industry also contribute to its localisation, favouring its growth at or near seaports well placed for the sale of its products, a situation of which the vast Sittingbourne and other Thames-side or Medway-side works form a good illustration. From the first introduction of paper-making into this country, the chief seats of the industry have lain in Kent (at Maidstone and elsewhere), and the manufacture is also largely carried on by the streams of Derbyshire and Mid-Lancashire (Darwen, Bacup, &c.), on the Kennet in Berkshire, in the Wycombe valley in Bucks, in Midlothian and Fifeshire. The manufacture of high-grade paper still remains in some of these localities. Dyeing (at least in the case of the more delicate shades) requires the same condition, and, where associated with bleaching, pure air is necessary over and above. It is hence characteristically an industry of small rather than large towns. Perth is the seat of some of the leading dye-works in the Kingdom; Dumbarton, Accrington, and Bacup carry on turkey-red dyeing. Chair-making is a speciality of beech-growing districts of the Chiltern Hills, where the industry before 1914 employed 50,000 families. The making of different parts of chairs (formerly seats in one district where the larger trees grew, and legs and the smaller parts where only small trees grew) is still carried on by small firms, the parts being merely put together in the towns (chiefly High Wycombe). Much furniture is made in the east of London. Sugar-refining is carried on principally at three seaports—London, Liverpool, and Greenock.

The refining of oil is an important new industry and is naturally carried on near, but not at, the leading ports. At Skewen, previously a barren area, near the town, oil refineries were erected in 1920 and connected with Swansea docks by pipes through which crude oil is pumped and refined oil returned for shipment. Similarly large works were established down the banks of the Humber below Hull; down the lower Thames at Shellhaven; along the Manchester Ship Canal, and elsewhere. After the Second World War the largest refineries in Europe were completed at Fawley on Southampton Water in 1952 and other very large works were constructed along the south bank of the lower Thames below Gravesend.

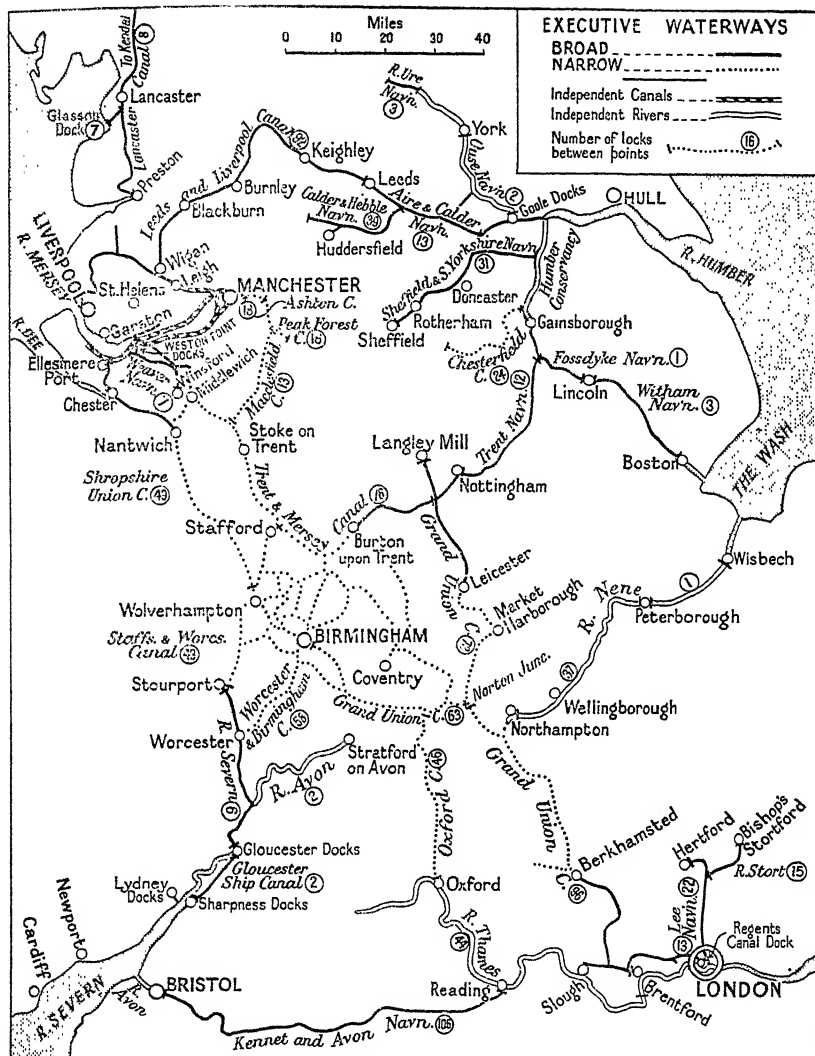
The making of shoes is the leading industry in Northampton and Mansfield, is among those of Leicester and Stafford, and is carried on to a greater or less extent in many other large towns of the country. The making of ladies' fancy shoes is the main survival of the old textile industry of Norwich. Until recently gloves were made at many small towns in agricultural districts, where labour was cheap, as at Worcester, Hereford, Woodstock in Oxfordshire, Taun-

ton and Yeovil in Somersetshire, Great Torrington in Devonshire, Chester, &c. The making of hand-made lace is an industry in a similar position, still pursued at Honiton in south Devon, where it has been practised since the time of Charles I, in the vale of Aylesbury in Bucks, and elsewhere.

Transport and communication. In view of the nature of the chief industries of the country, it is a matter of much importance that the high grounds of England interfere comparatively little with the facilities for locomotion. They have been overcome by rail and road but before the railway era, when water transport was so important, they were more serious obstacles. In relation to internal communication the most important of the former navigable rivers were the Ouse (Yorkshire), Trent, and Mersey, the Thames and the Severn with their tributaries. The Ouse is navigable for barges throughout its length, and its most important tributaries are navigable likewise or have been canalised. Although the number of locks renders them of little use now, three lines of canals were laid across the Pennines, bringing the ports of Goole and Hull on the east into connection with those of Liverpool and Preston on the west. By the valley of the Aire a canal, which has a branch to Bradford, ascends by way of Leeds and Skipton, crosses the watershed at a height of 477 feet, and descends on the Lancashire side by way of Burnley and Blackburn to Preston. By that of the Calder another line of canals ascends by way of Wakefield and Halifax, to descend by Rochdale to Manchester, where the Irwell becomes navigable. The third canal forms a more direct communication between the opposite sides of the Pennine Upland, but rises to a greater altitude. It joins Manchester with the Calder Canal by way of Ashton and Huddersfield. Its summit is at the height of 656 feet; the crossing at this altitude was effected only by piercing the Stanedge Tunnel, more than three miles in length.

From these particulars it might be inferred as a matter of course that canals in the lower regions of England are even more numerous, which is in fact the case. The Trent, the Mersey, the Thames, and the Severn are all interconnected by inland waterways, natural or artificial. The Trent itself is navigable for small sea-going steamers as high as Gainsborough and since 1926 has been improved for barge traffic to Nottingham, the Thames for vessels of 200 tons as high as Hampton, and the Severn for vessels drawing 6 feet as high as Stourport. The Berkeley Ship Canal, which connects Gloucester with the estuary of the 'sandy-bottomed Severn,' enables vessels drawing more than 10 feet to ascend to that town, avoiding the windings and shallows of the river.

The canals of England are mainly works of the latter part of the eighteenth and the early part of the nineteenth century. The Bridgewater Canal, constructed under the direction of James



ENGLAND: NAVIGABLE WATERWAYS

Based, by courtesy of the British Transport Commission, Docks and Inland Waterways, on a map in the official handbook, *British Waterways*. A separate large coloured map is also published.

The waterways are classed as 'narrow' or 'broad' according to their capacity to accommodate boats up to or over 7 ft. wide.

The numbers of locks along the canals are those given in the handbook of the Inland Waterways Association: *Inland Waterways of Great Britain and Northern Ireland*.

Brindley, was completed in its eastern section (from the Earl, afterwards the Duke, of Bridgewater's coal-mines at Worsley to Manchester) about the end of 1761, but was not connected with the Mersey till 1776. At the period when they were made canals were of very high importance for the development of English industry and commerce. Since the development of railways their value has steadily diminished. Some are still not without importance for the carriage of minerals and other bulky commodities, but even in the carriage of coal they are unable to compete with railways except where the conditions are exceptionally favourable to this mode of transport. What specially favours the Aire and Calder navigation in its use of the compartment boats described above on p. 104 is the fact that such boats can be used for the whole or nearly the whole distance between the coal-mines and the place of shipment at Goole. Actually the surface of Britain is not suited to the construction of canals when compared with France or Germany—the surface is not mountainous but sufficiently hilly to involve a large number of locks. The railway companies gradually acquired control of many of the canals of Britain; many have fallen gradually into disuse and have been closed, though at the same time the Grand Union Canal Company's system, uniting London with the Midlands, was improved after 1930 to accommodate 100-ton barges and has been partly provided with concrete banks. The map shows the canals in use in 1952. Beyond the northern limits of the map are the rivers Tees and Tyne. The former is navigable (draught over 6 feet) for 19 miles below Yarn; the Tyne for 19 miles.

The most important of Scottish canals is the Forth and Clyde Canal, which enables small sea-going ships to pass from Grangemouth on the Firth of Forth to a place on the Firth of Clyde a little above Dumbarton. A ship canal with a minimum depth of 17 feet was constructed through the long narrow valley called Glen More or the Great Valley, which connects Loch Linnhe and Loch Ness, and divides the Highlands of Scotland into two sections. It is called the Caledonian Canal, and is noteworthy as a work of engineering, but was never much used for the purpose for which it was designed—namely, to allow sea-going ships of moderate size to avoid the stormy passage through the Pentland Firth. The short Crinan Canal allows small steamers to pass from the Clyde to the west of Argyllshire without passing round the Mull of Kintyre.

It is almost typical of the condition of many English canals that of the arguments brought forward to prevent the abandonment of the Kennet-Avon Canal one was that the farmers needed it for watering their cattle; another that its abandonment would detract from the rural beauty of the quiet countryside. In 1921, which was a year of drought and in which many of the canals were short of water, the traffic originating on all the canals in the whole of Great Britain

(excluding the Manchester Ship Canal) amounted to less than 12m. tons of goods. During the next five years the canals failed to get back much of the traffic lost by the drought and in 1925 the corresponding figure was only 15,571,000 tons. In 1929 the tonnage had risen to 24,871,000, but in 1952 the canals of the Docks and Inland Waterways Board carried under 12½m. tons.

The success of the Manchester Ship Canal (opened 1894; see p. 339) for a time stimulated the formulation of schemes for other ship canals. Several projects for ship or larger barge canals were subsequently started (Bristol to the Severn, Sheffield and Leeds to the Humber, the North Staffordshire potteries to the Mersey), but none has been proceeded with.

What has been said regarding the construction of canals implies that in railway construction the obstacles presented by the physical features of the country were of still less consequence relatively to the much higher value of the new means of transit. In view of the distribution of population, the most serious hindrances to railway communication are those presented by the Pennine Upland and those on the routes connecting the most populous parts of England with the most populous parts of Scotland. Manchester and Sheffield are connected by a line passing through the Woodhead tunnel, which attains an altitude of over 1,000 feet. On the northern routes the chief connection between Lancashire and the valley of the Eden is now, as it always has been, by way of Shap Fell, where the summit level of the rails on the main west coast route to Scotland is 916 feet above sea-level; that between the West Riding of Yorkshire and the same valley reaches between the head-waters of the Ribble and Lune a height of 1,250 feet. The next high crossings on the northern routes are all in Scotland. In Glamorgan and Monmouthshire serious hindrances to communication are presented by the high ridges separating the populous coal-mining valleys in the west, more than one railway having to climb to an altitude of more than 1,200 feet within a short distance, involving gradients up to 1 in 45. Obstructions to communication presented by water have been overcome by low-level railway or road tunnels at the mouths of the Severn and the Mersey, and under the Thames at several places in London. The Severn railway tunnel, below Chepstow, the longest in the British Isles, is 4½ miles long. It was opened in 1886. A proposal to tunnel the Humber, thwarted by an adverse vote of a Committee of the House of Lords in 1873, was revived in 1907, but did not materialise. The proposal for a road bridge was given high priority in the post-1945 programme—second only to the road bridge over the Severn near the line of the tunnel. Under the Mersey tunnels for local rail traffic and road traffic connect Liverpool and Birkenhead. At the time of its opening in 1934 the Mersey road tunnel was the longest underwater road tunnel in the world. At

London main railway lines cross the Thames by bridges but there are many 'tube' railways and there is a road tunnel below the lowest bridged point.

The Scottish railways are most closely laid in the Midland Valley, and through the valleys of the Southern Uplands wind several railways connecting with the lowlands on the other side and with England. The lowest of all these routes, forming the shortest connection with England, is that by the east coast (the main east coast route), which has nowhere to rise as much as 500 feet above sea-level. The next route, on the west, has first to climb to above 900 feet between Edinburgh and Melrose, and then to about 1,000 feet in crossing in a tunnel a spur of the Cheviots between Hawick and Liddisdale, where the main line descends to the Solway, and a branch passes eastwards to the head of the valley of the North Tyne. A still more westerly route (the main west coast line) connects both Edinburgh and Glasgow with Carlisle, reaching between the valleys of the Clyde and the Annan an altitude of 1,028 feet. By winding far to the west, through Kilmarnock, a fourth line effects a crossing at a little more than 600 feet in height in passing from the valley of the Ayr to that of the Nith. The chief obstructions to communications offered by water in Scotland are overcome by means of two of the most remarkable railway bridges in the world, the Tay Bridge at Dundee, for many years the longest in the world (3,593 yards, or a little more than two miles), opened in 1887, and the Forth Bridge at Queensferry, a few miles above Edinburgh, 2,765 yards, or more than a mile and a half long, opened in 1890.

Under the Railways Act of 1921 (effective 1923) all the main railways of Great Britain were united into four groups with a view to economy of management. The groups were the Southern Railway, the Great Western Railway, the London, Midland and Scottish Railway, and the London and North-Eastern Railway. Under the Socialist Government which came into power in 1945 the railways were nationalised as British Railways, organised into six regions. One region comprises Scotland, the others correspond roughly with the former companies, with the L.N.E.R. divided into an Eastern and a North-eastern. Nationalisation came into effect on January 1st, 1948.

Plans for the electrification of railways had before the First World War been adopted by the main companies, especially for London suburban lines. On the Southern Railway nearly all the suburban lines were electrified in the inter-war period and the main lines as far as Eastbourne, Hastings, Brighton, and Portsmouth. The southern region of British Railways has now the largest electrified suburban system in the world, and has adopted the third rail system.

During the First World War train-ferries operated between Richborough and Calais and Southampton and Dieppe. The Richborough installation passed into private hands, and on October 11, 1921, the first commercial train conveyed by ferry, bringing about 300 tons of fruit from the south of France, arrived here. On April 24, 1924, a goods train-ferry from Harwich to Zeebrugge was formally opened, but it was left to the Southern Railway, in 1936, to inaugurate a through sleeping-car service for passengers to Paris *via* a train-ferry from Dover to Dunkerque. This followed the abandonment of long-considered schemes for a channel tunnel under the Strait of Dover.

The railways suffered very severely from road competition, but later, by Act of Parliament, acquired 'road powers,' and came to control or co-operate with many of the road transport companies. As a result, when British railways were nationalised, the bulk of the road haulage was included in the nationalisation. In 1953 the Conservative Government restored road haulage to private enterprise.

British foreign trade. In early times and throughout the Middle Ages the great feature of English trade was the export of raw materials and the import of manufactured articles. By far the most important of the exported raw materials was wool, but it was only one of several, the export duties levied on which furnished a large part of the revenue of the Crown. With the obvious intention of facilitating the collection of this revenue the regulation of this trade was attempted in the reign of Edward I, and the trade was more definitely organised by an ordinance of Edward III in 1353. Therein the only staple commodities enumerated are wool, wool-fells (that is, sheep-skins with the wool on), leather or hides, and tin, but on other occasions lead, cheese, butter, alum, tallow, and worsted are also mentioned—the last, however, very seldom. The ordinance decreed that all these commodities should when exported be taken exclusively to certain English, Welsh, and Irish ports, where the duties were collected. The English ports included all those of any consideration on the east coast except Berwick-upon-Tweed, also Southampton and Exeter on the south coast, and Bristol on the west. The reason for the exception of Berwick-upon-Tweed from the list of English ports probably was that if it had been included under the regulations of the staple, English wool would have been smuggled across the Scottish Border and exported from some Scottish port. Sometimes Newcastle also was omitted from the staple towns. Carmarthen was the sole staple port for Wales. In Ireland there were four: Dublin, Waterford, Cork, and Drogheda. No external staple port was mentioned, although there had been a staple abroad at various ports in the Low Countries at previous dates, and subsequently it was again found convenient to fix upon some external port as the one place beyond the seas to which all staple commodi-

ties should first be sent. From near the end of the fourteenth century till 1558 Calais was the sole external staple, but when the English lost Calais in that year the staple was transferred to Bruges. The trade in the staple commodities was mainly, but for one reason or another not at all times solely, in the hands of a privileged body known as the Staplers, who had a court of their own at Calais. The Staplers were mostly foreigners, and indeed several ordinances, including that of 1353, absolutely prohibited the trade in staple commodities to Englishmen, these being liable to smaller dues than foreigners. The loss that the revenue thereby incurred was one that the kings could not always afford, and one that was occasionally more than made good by the granting of special licences to Englishmen to engage in the staple trade even when there was a general prohibition. Such licences were of course obtained only on conditions that were advantageous to the Crown. Among the foreigners engaged in the staple trade of England were many Italians, but members of the Hanseatic League were still more conspicuous. The merchants belonging to this league had gained special privileges in the foreign trade of England before the close of the thirteenth century. In what was known as the Steelyard in London on the Thames, a site now partly occupied by Cannon Street Station, they had a well-protected residence with warehouses, and they had similar residences at some other English ports. Their privileges were for the most part maintained till 1598, when they were finally withdrawn by Queen Elizabeth.

Long before this, however, the trade of native English merchants had been growing through the efforts of an organised company known as the Merchant Adventurers. The name of 'adventurers' was given to those who traded in commodities not embraced by the regulations of the staple. English grain and honey could thus be freely exported to Norway and other parts in which such commodities found a market; but as English manufactures grew these became the most valuable commodities outside of the staple. Woollens accordingly came to be the chief wares whose sale abroad was pushed by the adventurers. When this body became a regularly organised society is uncertain, but in 1404 a charter was conferred upon it by Henry IV, and shortly after the company was enabled to establish its headquarters at Antwerp. Other charters were subsequently conferred upon it, and it grew to be an extremely influential body in the sixteenth and seventeenth centuries. Its headquarters were ultimately transferred to Hamburg, on which account it became known as the Hamburg Company, but though its chief seat was thus abroad the membership was absolutely restricted to Englishmen. In later days its special domain was all that part of the North Sea coast which lies between the Strait of Dover and the north of Denmark. It became, however, the parent or the model of several

other merchant companies, which claimed, if they did not always enjoy, monopolies of trade elsewhere. Sebastian Cabot, who with his father John Cabot had made the first voyage from England to America in the search for a north-west passage to India in 1497, lived long enough to suggest to the Merchant Adventurers in the middle of the following century a voyage in search of a north-east passage to the same destination. The voyage was actually made in 1553 under Willoughby and Chancellor and led to the discovery of a route to the White Sea and the mouth of the Northern Dvina. In the same year a company known as the Muscovy Company received a charter conferring upon it privileges in the trade with Russia and Persia. In 1579 the Eastland Company obtained its first charter conferring privileges in connection with Scandinavian and Baltic trade. Afterwards the Levant or Turkey, the East India, and the Africa or Guinea Companies, as well as the Hudson's Bay Company, were successively founded. The most important of these for the future of England was of course the East India Company, which obtained its first charter on the last day of 1600, and subsequently to the implicit annulment in the Declaration of Rights in 1689 of all royal monopolies of trade, had a monopoly of the Eastern trade expressly conferred upon it by Parliament. This monopoly was retained for India till 1813 and for China till 1833. By this date the Company had become a great territorial power, and from 1833 it was nothing else.

Meanwhile the nature of English trade had completely changed. English manufactures had long been the principal exports. Throughout the eighteenth century woollens were the most important of these, and so jealously was any rivalry in this trade regarded that every effort was made to check the rise of a similar industry in Ireland. In the course of the eighteenth century cotton goods came to acquire more importance. They were among the goods which Bristol and other merchants carried from England to West Africa to be exchanged for slaves sold in the West Indies, whence the ships returned home with cargoes of sugar and other tropical produce, a highly lucrative trade not put an end to till January 1, 1808, when the slave trade was made illegal. At last came the revolution in industry which created a new era not merely for English commerce but for the commerce of the world, and which in England speedily had the effect of raising cotton manufactures to the first place among our exports. Later the practice of conferring royal charters on trading companies was revived. Between 1880 and 1890 such charters were granted to the British North Borneo Company, the British South Africa Company, the Royal Niger Company and the Imperial British East Africa Company. Though the first two of these Chartered companies still exist, their territorial powers have been restricted.

We may now examine the salient features of British foreign trade over the past fifty or eighty years. First we note the high place which bulky articles have taken both in our import and export trade: among the imports timber, grain and ores; among the exports, above all, coal. To appreciate the importance of this fact, however, one must compare the values of the commodities with the values per ton. That will enable one to understand how, for example, iron ores with their average value of less than £1 per ton, though low in order of value among imports, must take a quite different place in an enumeration of British imports according to quantity. Very bulky in proportion to value is coal, which in respect of quantity has been by far the most important of British exports.

The export trade in coal has long been one of peculiar importance to Great Britain. Especially until the First World War when, in 1913, a total approaching 100m. tons of coal was exported or sent away in bunkers, a large amount of our shipping was employed in the carriage outwards of this one commodity. On the assumption that four register tons of shipping would be required to convey nine tons weight of coal, this represents over 40m. register tons of shipping. In 1898 coal was estimated to make up 86 per cent. of the total weight of British exports. The indirect importance of this traffic to the commerce of the United Kingdom was through the fact that the ships that went out laden with coal were ready to bring back cargoes of foreign goods at low freights.

Coal and coke were chiefly exported from fields near the sea—from Cardiff, Newport, and Swansea, the outlets of the South Wales coal-field, and the Tyne ports (Newcastle and North and South Shields), Sunderland, and Hartlepool, the outlets of the Northumberland and Durham coal-fields, and from various ports on the Firth of Forth. The excellence of the so-called smokeless (that is nearly smokeless) coal furnished by the eastern part of the South Wales coal-field as fuel for steam-engines caused Cardiff to outstrip Newcastle in the export of coal to foreign countries, but Newcastle and Sunderland rank first among the ports which supply coal in coasting vessels for domestic use, their convenient situation for the supply of London being much in their favour. The actually smokeless coal known as anthracite is produced only in the western part of the South Wales field. The diminution in the demand for Cardiff steam coal accounted for the depression in the coal trade of South Wales in inter-war years.

Both the production and export of British coal reached their highest totals in 1913 just before the outbreak of the First World War. Naturally shipments were interrupted by the exigencies of that war and by the submarine menace, and the old markets were never fully recovered. Much of the world's shipping, both British and foreign, naval and mercantile, changed to oil fuel so that British

bunker coal was in smaller demand and less was sent to the world's coaling depôts; many countries formerly buying coal were compelled to develop their own resources. In the nineteen-twenties there was much unemployment amongst miners in South Wales, Durham, and elsewhere, and the great strike of 1926 did not help the recovery. Thereafter there was some improvement until again war in 1939 disrupted the whole industry. Britain nationalised first her coal resources and later her whole coal industry; mines were modernised to the extent that from 1946 more than 75 per cent. of the coal was cut mechanically. During the Second World War young men had to go into the armed services and the average age of miners rose to 39 in 1942-47 compared with 36 in 1937. After the war young men did not take to mining and a new difficulty arose. Britain has reserves to last 800 or 1,000 years, has many customers, especially in Europe, anxious to buy at least 50m. tons a year but cannot get enough labour to satisfy home needs. In 1953 the domestic consumer was still rationed.

When we reflect that all our external trade as well as much of our internal trade is necessarily carried on by sea, and that that trade involves such an enormous quantity of bulky cargoes both outwards and inwards, it is obvious that we have here one important cause that must tend to promote British shipping, the magnitude of which has already been referred to. When we consider also our local advantages for the building of steel ships and their engines, and the large proportion of our maritime population, the great and long continued importance of British shipping is not surprising.

Another striking feature of British trade has long been the large excess of the value of the imports over the exports, amounting on the average of the five years 1906 to 1910 to £142m.; in 1913 to £158m.; in 1924 to £341m.; in 1930, £387m.; in 1935, £275m. The explanation of this is found in what have come to be known as invisible exports, that is, economic services rendered by the people of this country to other countries for which those who render such services are entitled to be paid. The most important of these are loans to foreign countries and British possessions and the earnings of British shipping on foreign or colonial account. Much uncertainty is indeed introduced into these estimates by the fact that registration of shipping under a certain flag does not prove that the shipping is all owned by subjects of the nation to which that flag belongs, and that loans to countries abroad issued in the United Kingdom are not all held by residents in this country, but may and often do include large sums lent by foreigners. Much shipping under foreign flags is owned by British subjects, but, on the other hand, some foreign capital is invested in British ships. Thus, in 1902 the International Mercantile Marine Company was incorporated at Trenton, New Jersey, and acquired

the control of most of the chief British Atlantic steamship lines, whose ships, however, retained British registration, although the British holding in the company amounted to only £13m. against an American holding of £21m. The British lines transferred to the company were the White Star, Dominion, America and Leyland lines. The principal British company trading with the United States remaining outside the International Company was the Cunard Company, with which about the same time the British Government made an agreement that, on condition of its remaining a purely British undertaking for twenty years, holding for that term all its vessels at the disposal of the British Government on agreed terms, agreeing 'not to unduly raise freights' or give preferential rates to foreigners, and undertaking to 'build two large steamers for the Atlantic trade of high speed,' the British Government would lend the money to build the ships, and from the time when the ships began to run would pay to the company an annual subvention of £150,000. In 1926 the White Star Line was repurchased by British interests for £7m. and later merged with the Cunard. With Government help the Cunard White Star Line launched the *Queen Mary* in 1936. This was followed by the launching of the *Queen Elizabeth* in 1939. Both ships carried immense numbers of troops during the war and, maintaining speeds of over 30 knots, succeeded in eluding submarines. When returned to civilian use they remained by far the largest ships afloat. The *Queen Mary* regained for Britain the 'Blue Riband' for the fastest crossing of the Atlantic in 1938 and held that record until the maiden voyage of the American *United States* in July 1952. Despite the sinking of very large numbers of vessels during the Second World War, the British merchant fleet in 1952 was the second largest in the world, surpassed only by that of the United States, much of which was not in use.

Large sums of money were also earned by Britain by banking and insurance and, up to the outbreak of the Second World War, London remained the banking centre of the world.

The Second World War resulted in the sale of many of Britain's overseas investments, the loss of large numbers of merchant vessels, and the passing of financial world leadership to New York. Instead of invisible exports—in return for which there was an automatic inflow of food-stuffs and raw materials—equal to a third of the total of imports and ranging in the years 1913 to 1938 from a low of £255m. in 1932 to a high of £595m. in 1920, Britain found herself in 1945 having to pay her way by selling exports to the value of imports needed. American aid, a recovery in such invisible exports as the tourist trade and shipping helped to adjust the balance, but the export drive remained paramount in national economy. The home market had to be starved and many articles were reserved for export and were not available for home consumers.

Even allowing for increased output of food by British farmers—up to 55 per cent. of the total consumed—food-stuffs remain dominant amongst imports. Wheat, flour, and meat are essentials. Other main features are shown in the tables.

No less striking than the high place taken by food-stuffs among British imports is the remarkable preponderance long held by cotton manufactures among the exports, even though their relative importance has been slowly diminishing. It has already been pointed out that this preponderance is at least in large part due to the great commercial advantages of Great Britain, the special facilities that this country has for reaching all those parts of the world most easily reached from the seaboard, combined with the fact that cottons are or at least were in universal demand. In connection with this it should be added that this country makes use of all its great ports in disseminating its cottons. In any one year the proportion of the value of cotton manufactures and yarns exported from the two ports of Liverpool and Manchester is only about two-thirds of the whole, leaving one-third to be exported by London, Southampton, the Humber ports, Glasgow, Harwich, and others. No ship ever leaves Liverpool entirely laden with cotton goods. A cargo of 500 tons of such goods is considered a very good lading for a ship with a total cargo of 3,000 tons. The long continued export of iron and steel manufactures was also a remarkable illustration of the commercial advantages of this country, especially when we consider the relative advance of other countries in the conditions favouring the initial stages of the industry. In 1886-90 the United States took about three-fourths of the value of the tinned plates exported from this country, one of the most important articles under this head. Now the import of tinned plates into that country is comparatively small, and this is typical of the changes wrought in British trade as, one after another, her former customers have developed their own manufacturing industries. Iron and steel were among those comparatively bulky commodities that helped to cheapen the carriage of more valuable ones.

As to destinations of exports we may note that the maximum percentage to India was in 1886-90, after which it remained comparatively steady for a long period, but with a marked drop after the First World War. Exports to the British Commonwealth and Empire as a whole remained between 30 and 40 per cent. from 1880 to 1913, but began a steady rise above 40 after the First World War. From 1871 to the present day the highest percentage to the United States was in 1871-75, since when, with the establishment of home manufactures in that country, there has been a steady decline. This is an outstanding example of the trend of trade with all 'new' countries as they develop.

UNITED KINGDOM
IMPORTS OF MERCHANDISE

	Percentages of Total Value.				
	1924.	1926-30.	1931-35.	1938.	1951.
<i>Raw Materials</i> . . .	31.4	28.3	24.5 ¹	27.0	43.8
Raw cotton . . .	9.5	6.0	4.6	3.2	6.6
Raw wool . . .	5.5	4.7	4.9	4.6	6.3
Wood and wood pulp .	4.0	4.8	5.5	6.4	8.8
Petroleum . . .	—	3.6	4.2	3.3	9.0
Oil-seeds and nuts . .	4.1	1.4	1.5		
Rubber . . .	0.8	1.7	0.9	1.3	4.1
Hides, skins and furs .	1.7	2.2	2.1	2.0	1.8
Zinc, lead, tin, copper, iron ores . . .	1.8	2.4	1.8	3.0	3.2
<i>Foodstuffs</i> . . .	44.7	44.1	49.5 ¹	46.8	33.2
Meat . . .	8.2	9.5	12.2	9.9	5.4
Fresh beef and mutton	4.1	4.0	5.5		
Bacon and hams . . .	3.5	4.4	4.5		
Animals . . .	1.7	1.1	1.2	1.0	0.5
Grain and flour . . .	9.5	8.3	8.7	8.1	6.3
Wheat . . .	5.4	5.0	4.1	4.2	3.4
Maize . . .	1.3	1.1	1.5	1.9	0.8
Wheat meal and flour	0.7	0.6	0.5	0.4	0.5
Butter . . .	4.3	4.2	5.2	5.5	2.3
Tea . . .	3.2	3.1	3.6	3.3	1.9
Sugar . . .	3.5	2.0	2.0	2.1	2.7
Raw . . .	—	1.6			
Refined . . .	—	0.4			
Fresh fruit . . .	2.5	2.9	4.0	4.1	2.9
Eggs . . .	1.5	1.4	1.2	1.7	0.6
Cheese . . .	1.1	1.2	1.1	1.1	1.0
Tobacco . . .	1.2	1.4	1.7	2.5	2.1
<i>Manufactures</i> . . .	23.4	26.9	24.8 ¹	25.4 ²	22.6 ³
Silk yarns and manufrs.	2.0	1.2	0.6	0.5	0.7
Wool yarns and manufrs.	1.2	0.9	0.6	0.4	0.8
Apparel . . .		1.6	1.3	0.9	0.2
Cotton yarns and manufrs. . .	0.7	0.8	0.5	0.3	1.4
Iron and steel manufrs.	1.7	2.3	1.5	1.6	1.1
Machinery . . .	0.8	1.4	1.6	2.3	1.4
Leather manufrs. . .	1.1	1.2	1.1	0.7	0.6
Chemicals . . .	1.2	1.3	1.0	1.5	1.7
Paper and cardboard .	—	1.5	1.8	1.6	2.2
<i>Annual Total in £ millions</i>	1,279.8	1,184.5	745.5	919.5	3,914.2

¹ Classes for 1931-4 only.² Includes 'Non-ferrous metals and manufactures', amounting to 4.4% of all imports; and 'Oils, fats and resins, manufactured' (chiefly refined petroleum), amounting to 4.8%.³ Includes 'Non-ferrous metals and manufactures', amounting to 4.3% of all imports; and 'Oils, fats and resins, manufactured' (chiefly refined petroleum), amounting to 4.0%.

UNITED KINGDOM

SPECIAL EXPORTS

	Percentages of Total Value.				
	1924.	1926-30.	1931-35.	1938.	1951.
<i>Raw Materials</i> . . .	13.3	9.9	11.9 ¹	12.1	3.7
Coal and coke . . .	9.8	6.4	8.7	8.0	1.1
<i>Foods</i>	7.0	7.6	8.0 ¹	7.6	6.2
Fish	1.1	1.1	1.1	0.8	0.2
Spirits	1.5	1.3	1.6	2.4	1.3
<i>Manufactures</i> . . .	77.4	79.8	76.3 ¹	77.5	88.1
Cotton manufrs. . .	24.9	19.2	15.3	10.5	8.1
Yarn	3.5	3.0	2.7		
Thread	0.9	0.9	1.1		
Iron and steel . . .	9.3	8.3	6.9	8.8	6.2
Machinery	5.6	7.4	8.3	12.1	14.2
Automobiles	0.8	2.4 ²	3.3 ²	9.6 ³	18.6 ³
Railway vehicles . .	1.0	1.4	0.6		
New ships	0.7	1.8	1.1		
Electrical goods . .	1.3	1.8	1.9	2.9	3.7
Wool manufrs. . . .	8.5	7.2	6.9	5.7	6.9
Tissues	5.2	4.6	3.8		
Yarn	2.0	1.5	1.6		
Tops	0.8	0.7	0.8		
Silk and art silk . .	0.3	1.4	1.3	1.2	2.5
Linen yarn and manufrs. .	1.7	1.4	1.5	1.3	1.0
Apparel (including boots and hats) . .	3.8	3.7	3.0	2.2	2.3
Paper and cardboard .	1.2	1.4	1.6	1.5	1.6
Rubber manufrs. . .	0.3	1.3	1.4	0.3	0.5
Earthenware and glass	1.6	1.9	2.0	2.0	2.6
Leather manufrs. . .	1.5	1.1	0.9	0.8	0.7
Chemicals	3.2	3.5	4.7	4.7	5.5
<i>Annual Total in £ millions</i>	795.4	677.2	389.5	471.4	2,580.0

¹ Classes are for 1931-4 only.² Includes cars and other road vehicles and parts.³ Vehicles, including locomotives, ships and aircraft.

EXPORTS OF IMPORTED PRODUCE

	Percentages of Total Value.				
	1924.	1926-30.	1931-5.	1938.	1951.
<i>Raw Materials:</i>					
Wool	22.4	22.3	22.3	20.4	27.8
Rubber	7.2	13.2	3.7	4.4	22.7
Raw hides	1.4	1.2	0.7	} 15.6	13.1
Raw skins and furs	8.0	8.6	12.4		
Cotton	8.3	4.9	3.3	2.0	0.4
Jute	0.3	0.3	0.4	1.1	— ²
Petroleum	—	1.3	1.9	1.3 ¹	1.8 ¹
Tin	1.8	1.7	1.2	— ²	— ²
<i>Foodstuffs:</i>					
Tea	5.0	6.8	8.7	7.5	2.5
Meat	—	3.1	2.3	0.9	0.6
Fish	—	1.4	1.2	0.7	0.3
Spices	—	0.9	0.4	0.2	1.1
Tobacco	—	0.7	1.3	1.3	1.0
Coffee	1.2	1.8	2.7	0.6	0.3
Butter	—	1.2	1.9	0.8	0.1
Fruit	—	1.2	2.1	2.0	0.6
Maize	0.7	0.6	0.9	1.4	— ²
Wine	0.5	0.5	0.7	0.8	0.7
<i>Manufactures:</i>					
Leather	1.3	1.7	2.0	1.5	0.5
Silk goods	2.5	1.4	0.8	0.3	0.1
Carpets and rugs	—	1.3	1.0	0.5	0.7
Cotton manufrs.	1.8	0.7	0.3	0.3	0.6
Machinery	—	1.4	1.2	1.5	0.4
Art silk	—	0.6	0.9	0.5	0.7
Drugs and medicine	—	0.4	0.7	0.8	1.7
<i>Total in £ millions</i>	140	113	54	62.0	127.0

¹ Refined petroleum.² Value insignificant.

The table of the trade statistics of the United Kingdom on this page relates to a highly characteristic trade, one in articles that have been collected from many different parts of the globe, to be as widely distributed again in other parts. The wool of Australia and South Africa is sent by us to Germany, France, and even the United States; raw cotton from America, Egypt, and India is re-distributed on the continent of Europe; silks are imported from France and sent to Australia along with the numerous products of British industry destined for the same market, and so on. A considerable variety of articles of Eastern origin, including tea and Egyptian cotton, is exported by us to the United States. The commodities that make up this *entrepôt* trade, as it is called, are mainly

such as are bought by British merchants to be resold to customers whether at home or abroad, so that they enter into the *entrepôt* trade only when bought on foreign or colonial account, but nearly a quarter of this trade is or was in goods originally bought for countries abroad, but sent to this country on through bills of lading. On the

IMPORTS BY COUNTRIES

Countries of Origin.	Percentages of Total Value.				
	1924.	1926-30.	1931-35.	1938.	1951.
United States	18.5	16.3	11.6	12.8	9.7
Argentina	6.2	6.1	6.4	4.2	2.2
Germany	2.9	5.6	4.9	3.3	2.0 ¹
India and Pakistan	6.2	5.1	5.0	5.4	4.9 ²
France	5.3	4.9	3.3	2.6	3.5
Denmark	3.8	4.6	5.2	4.1	2.9
Australia	4.6	4.4	6.6	7.8	6.4
Canada	5.2	4.4	6.2	8.8 ³	6.7
Irish Republic	4.0	3.8	3.2	2.5	1.8
Netherlands	3.3	3.8	3.3	3.2	3.3
New Zealand	3.8	3.9	5.1	5.1	4.2
Belgium	2.8	3.0	2.5	2.0	2.2
U.S.S.R.	1.5	2.2	2.8	2.1	1.5
Sweden	1.6	2.0	2.3	2.7	3.5
Egypt	3.0	1.9	1.6	1.3	1.2
Commonwealth	30.2	27.1	33.5	36.9	41.6
Foreign Countries	69.8	72.9	66.5	63.1	58.4

¹ West Germany 1.9, East Germany 0.07. ² India 3.9, Pakistan 1.0. ³ Includes Newfoundland.

EXPORTS BY COUNTRIES

Countries of Destination.	1924.	1926-30.	1931-35.	1938.	1951.
India and Pakistan	11.3	11.2	8.8	7.2	6.3 ⁴
Australia	7.8	7.2	5.6	8.1	12.6
United States	6.6	6.3	5.0	4.3	5.3
Irish Republic	5.3	5.5	6.2	4.4	3.8
Germany	5.4	5.1	4.3	4.4	1.9 ⁵
Canada	3.5	4.6	4.8	5.0 ⁶	5.3 ⁶
Union of South Africa	3.8	4.2	6.2	8.4	6.4
Argentina	3.4	4.0	3.4	4.1	1.1
France	5.2	3.9	5.0	3.2	2.1
Netherlands	3.1	3.1	3.2	2.8	2.8
Belgium	2.8	2.9	2.5	1.7	2.2
New Zealand	2.6	2.7	2.8	4.1	4.3
Italy	2.2	2.0	2.3	—	—
Commonwealth	41.7	45.6	45.7	44.6	51.3
Foreign Countries	58.3	54.4	54.3	55.4	48.7

⁴ India 4.5, Pakistan 1.8.

⁵ West Germany.

⁶ Includes Newfoundland.

other hand, it does not include the value of the goods transhipped at British ports in bond.

That the central position of this country contributed to the growth of this trade would seem to be indicated by the fact that from 1886 to 1913 about three-fifths of the value of the trade was carried on with the United States on the one hand and Germany, France, and Belgium on the other.

Still the great development of the *entrepôt* and transhipment trade is not to be ascribed solely to the geographical position of this country. Two other important factors may be pointed out as contributing to this result. One is the peculiarly one-sided character of British industries. The fact that so large a proportion of the exports of the country consists of manufactured goods of various kinds necessarily makes it dependent on other countries to an unparalleled extent for imports of food-stuffs and raw materials. The large trade with all parts of the world based on the country's own products and requirements necessitates the employment of a vast amount of shipping, which furnishes at the same time conveniences for an *entrepôt* and transhipment trade. The other important factor referred to as likely to stimulate the trade of this class is the trade in coal and other bulky articles, the indirect results of which are likely to be favourable to this trade in much the same way as it promoted our import trade generally. The chief articles in the *entrepôt* trade are of comparatively high value in proportion to their bulk. Of those enumerated in the table, jute was the only one of relatively low value per ton. A further circumstance favouring this trade is the number and situation of our seaports. Part of the *entrepôt* trade of the country, for example, consists in the exporting at Dover of wool imported at London, the exporting at Hull of raw cotton imported at Liverpool.

We cannot put out of sight the fact which has become abundantly clear since the Second World War that, however great the advantages of the United Kingdom may have been for the carrying on of manufacturing industries and foreign commerce, these advantages were much greater at a period when the British Isles had coal-fields more or less developed and other countries had not, when these islands had already effected the change from domestic and hand-labour in spinning and weaving and other countries had not. Hence it was inevitable that foreign countries, and especially those provided by nature with coal-fields or abundant water-power, should gain upon the United Kingdom in the great branches of industry to which modern machinery is chiefly applied, and gain all the more rapidly because they begin with the latest machinery and the most advanced organisation, while the older seats of industry are inevitably burdened more or less with what is out of date.

Seaports. On the average of the period 1908–12 the ten following

seaports—London, Liverpool, Hull, Manchester, Harwich, Southampton, Bristol, Glasgow, Leith, and Grimsby—received nearly 83 per cent. of the total value of the imports of the United Kingdom, and dispatched nearly 85 per cent. by value of all the exports. In recent years the order has been London, Liverpool, Hull, Southampton, Manchester, Glasgow, Harwich, Bristol, and Grimsby. The first two of the seaports just named handle 60 per cent. of the total trade; Liverpool normally leads in exports, but London in imports and *entrepôt* trade.

First in rank among the British seaports still stands London, as it always has done, having received during the years 1909-13, 33 per cent. of the imports in value and dispatched 25 per cent. of the exports—proportions which have steadily increased since the First World War except for the obvious set-back of the Second World War. The situation at the head of ocean navigation on a river which allows ocean vessels to ascend far into the interior of the Kingdom, and which has its mouth directly opposite another great estuary—that of the Scheldt—and nearly opposite the mouth of the Rhine, gives it a commanding position for continental trade. It is these two circumstances which determined its early growth, and hence indirectly made it the capital of the country, a position which favoured its further increase in population and wealth more and more as the British Empire extended. It thus became ultimately the greatest import market in the world, a fact which of necessity greatly promoted its *entrepôt* and transshipment trade, especially since so much of that trade, on the export side, is carried on with the neighbouring continental countries. More than 50 per cent. of that characteristic trade of the United Kingdom is carried on at this port. The enormous local market—Greater London has a population of over 9m.—together with the facilities for redistribution by both land and sea, are no doubt the circumstances that have made London the one great port, not only for such eastern products as tea and spices, but also for coffee and cocoa, and it is no doubt the latter circumstance—the ease of redistribution, as well as collection—that has been the determining factor in making London the chief centre for Australian trade. Increasing difficulty was felt in meeting the requirements of the enormous shipping of this port, and the complaints of shippers led in 1908 to the passing of the Act placing the whole port, defined as extending from the tidal limit of the river at Teddington Lock to a line joining Havengore Creek in Essex to Warden Point in the Isle of Sheppey, under the control of a single authority known as the Port of London Authority, which has acquired not only all the docks of importance, but also the warehouses belonging to them. This authority provided for the establishment and maintenance of a 14-foot channel at low water up to London Bridge, and one of 30 feet in depth with a minimum

width of 600 feet up to the Albert Docks opposite Woolwich. The Tilbury Docks, opened in 1886, were the deepest docks of the port, 38 feet; and they had $54\frac{1}{2}$ acres of water-space; the docks were extended, a new lock opened at Tilbury in 1929 with a length of 1,000 feet and width of 110 feet.

Liverpool has risen to a high rank among the seaports of the world only within the last two hundred and fifty years. Early in the eighteenth century it was a small place; its chief trade was with Ireland, and in that trade it had rivals in Preston and Chester, which were equally well suited for the small ships then in use. Its importance rose with the growth of the American trade and with the development of the cotton, woollen, and other manufactures of its hinterland, which may be said to include the whole of the industrial area from the Ribble to the north of Warwickshire and even, for the bulk of oceanic traffic, that lying to the east of the Pennine upland in the West Riding of Yorkshire. The inadequacy of the ports at the mouths of the Ribble, Dee, and even the Severn, prevents them from offering in the meantime any serious rivalry. Since 1894, however, as noted above, its hinterland has been encroached on by the port of Manchester. Though the Mersey, as a mere harbour, is capacious enough to admit all the fleets of the world, the building of docks and quays has been necessary for commerce, and the six or seven miles of continuous docks on the Liverpool side of the Mersey present a sight unparalleled elsewhere. The port of Liverpool includes the docks on the Cheshire side of the Mersey at Birkenhead, as well as the Garston docks on the Lancashire side, formerly belonging to the London, Midland and Scottish Railway Company, whose train marshalling sidings are a special feature. The port is under the control of the Mersey Docks and Harbour Board, constituted in 1857. A sandbank at the mouth of the Mersey, which formerly prevented the entrance of large vessels at low tide, has been dredged so as to allow of large modern liners entering or leaving the port at dead low water. Birkenhead-Wallasey, since the completion of the rail and road tunnels under the Mersey, may be fairly regarded as forming geographically part of Liverpool.

Hull, lying as it does on the east or continental side of the island, is one of the older ports of England, though its antiquity does not reach back to Roman times. It is said to have been founded by King Edward I, who here encouraged the building of a town, which was called King's Town. Hence the full name of the town, Kingston-upon-Hull, Hull being properly the name of a small river which enters the Humber at the place where the town stands. Its ancient and large trade in fish is still maintained, being favoured by the convenience of its situation for the supply of the northern midlands, though to a less extent London and the southern midlands, for which, especially London, Grimsby on the Lincolnshire coast

has greater advantages. For the same reason its wool imports for the supply of Yorkshire increased at the expense of London. Thus the import of raw wool at Hull in 1913 was 48m. lb. (less than 10 per cent. of that of London), in 1920, 70m. lb. (nearly 14 per cent. of London), in 1929, 148m. lb. (over 38 per cent. of London), but the proportion has since fallen. The leading import of Hull is, in normal years, wheat; but the port resembles London in the very general nature of the cargoes handled. Many of the imports are off-loaded into lighters for water carriage into the hinterland. It has also a large trade in oil-seeds, a trade favoured by the large adjacent markets for oil-cake on the one hand, and for the oils and oil products in the manufacturing districts. The port of Grimsby includes Immingham, a short distance to the north, which has been specially equipped for the export of coal and large iron and steel castings. Goole, the third of the Humber ports, owes its importance chiefly to the shipment of coal brought by the Aire and Calder navigation and development by the former London, Midland and Scottish Railway.

Glasgow, now surpassed by Southampton in respect of the total value of its imports and exports, has had a history in many respects similar to that of Liverpool. It rose into importance only with the development of the New World and modern manufacturing industry, and the accommodation that it affords for mercantile shipping has had to be provided artificially to even a greater extent than in the Mersey. Its first lucrative trans-oceanic trade was with the southern 'Plantations' of North America and the West Indies, whence tobacco and sugar, then relatively more valuable than they are now, were imported. The trade began as a smuggling trade even before the union of the English and Scottish parliaments, but so flourished afterwards that Glasgow beat all its English rivals in the tobacco trade. The tobacco was brought from the Plantations under the regulations then in force first to this country, but being mostly for export to the continent, had a shorter land transport, even from Irvine, which was then the port of Glasgow, to an eastern port (Bo'ness), than could be found at any other port in Great Britain. The Clyde, however, was then but a small river. Little more than a hundred and fifty years ago it was still fordable twelve miles below Glasgow. Then came the modern inventions which made coal and iron so all-important, and the fact that these minerals are found together in the immediate vicinity of Glasgow made it worth while to convert the river into a channel of the sea, bearing on its waters the ships of all nations, and of the deepest draught. Glasgow, at the same time, is a great manufacturing town, but the industries carried on there are so varied that none can be singled out as specially characteristic, except the shipbuilding of the Clyde and marine engineering. As the western outlet of one of the chief

manufacturing districts of Great Britain its export trade is large, and Glasgow is indeed singular among the great ports of the country in having for long had an export trade 50 per cent. more in value than its import trade. The reason is that many of the most valuable of the imports of the Glasgow district come from the continent and enter the country by the eastern ports of Leith and Grangemouth, which latter has supplanted Bo'ness since its foundation on the mud-bank chosen for the eastern terminus of the Forth and Clyde Canal.

Southampton, the chief commercial port on the south coast, is one whose commerce and shipping, like those of the other southern ports, reach back to an early date. A Roman station existed on the small tongue of land between the Itchen and the Test, on which the town is situated. In 1891 its docks, which now afford accommodation alongside of the quay walls for the largest ships yet built, were acquired by the London and South Western Railway Company, later part of the Southern Railway, and since then its shipping has increased at a more rapid rate than that of any other leading British port. Its position, together with its ample accommodation and easy entrance, makes it a convenient calling-place for transatlantic liners. It is the only port, besides London, on the south or south-east of England that has an export trade exceeding 2 per cent. of the total value of the export trade of the United Kingdom, its trade under this head being fairly representative of British export trade generally. An important feature of its import trade is the reception of large quantities of fresh and refrigerated meat and fruit. It has also a large passenger traffic, especially with North and South America and Africa. It is indeed the premier passenger port for passengers to and from destinations outside Europe. With Southampton may be contrasted the ports which deal with European passenger traffic—Dover, Folkestone, and Newhaven, along the south coast, and Harwich on the east—all having an import trade similar in character, but a relatively small export trade. The imports are largely made up of perishable articles, such as butter, eggs, fresh meat, poultry, fish, fruit, and of manufactured articles of relatively high value in proportion to their bulk, such as silks, woollens, gloves, watches, and parts of watches. Folkestone and Dover together admit much of the wearing apparel of continental origin imported into this country. Bristol is the only western seaport noted in the early commerce of England. Owing to the shallowness of the upper part of the estuary of the Severn, it served as an outlet not only for the populous region immediately to the east of it, but also for the Severn valley, and after the settlement of the New World it was one of the first seaports to secure a large share of the trade in tobacco and sugar. At the present day its import trade continues large, but its exports are comparatively small. Its development was

retarded by the inadequacy of the Avon to meet the requirements of large modern ships. The corporation of the city of Bristol therefore constructed large deep-water docks near the mouth of the Avon, at Avonmouth, included in the port of Bristol. Considering the position of the port one might expect that, with sufficient shipping accommodation, it ought not merely to carry on a large passenger traffic, but to serve, in great measure, as the port for the

CITIES AND TOWNS OF GREAT BRITAIN AND NORTHERN IRELAND, 1931 AND 1951

ENGLAND		1931		1951	
	1931	1951			
London			Portsmouth		
(County)	4,397,000	3,348,000	(City)	252,000	233,000
Greater			Preston	120,000	119,000
London	8,216,000	8,346,000	Reading	97,000	114,000
Birkenhead	151,000	142,000	St. Helens	107,000	110,000
Birmingham			Salford (City)	223,000	178,000
(City)	1,003,000	1,112,000	Sheffield (City)	518,000	513,000
Blackburn	123,000	111,000	Southampton	176,000	178,000
Blackpool	106,000	147,000	Southend-		
Bolton	177,000	167,000	on-Sea	130,000	152,000
Bournemouth	117,000	145,000	South Shields	113,000	107,000
Bradford (City)	299,000	292,000	Stockport	126,000	142,000
Brighton	147,000	156,000	Stoke-on-Trent		
Bristol (City)	404,000	442,000	(City)	277,000	275,000
Coventry (City)	178,000	258,000	Sunderland	186,000	182,000
Croydon	233,000	250,000	Wallasey	98,000	101,000
Derby	142,000	141,000	Walsall	103,000	115,000
Gateshead	125,000	115,000	Wolverhampton	139,000	163,000
Huddersfield	123,000	129,000	York	94,000	105,000
Hull (City)	314,000	299,000			
Ipswich	88,000	105,000	WALES		
Leeds (City)	483,000	505,000	Cardiff (City)	227,000	244,000
Leicester (City)	258,000	285,000	Swansea	165,000	161,000
Liverpool (City)	856,000	790,000	Rhondda	141,000	111,000
Manchester			Newport	98,000	105,000
(City)	766,000	703,000			
Middlesbrough	139,000	147,000	SCOTLAND		
Newcastle-upon-			Glasgow	1,088,000	1,090,000
Tyne (City)	286,000	292,000	Edinburgh	439,000	467,000
Northampton	97,000	104,000	Dundee	176,000	177,000
Norwich (City)	126,000	121,000	Aberdeen	167,000	183,000
Nottingham					
(City)	276,000	306,000	NORTHERN IRELAND		
Oldham	140,000	121,000	Belfast	415,000	444,000
Plymouth (City)	213,000	209,000			

The above table includes all towns and cities with more than 100,000 persons in 1951 except those forming a part of Greater London (of which Croydon is really one). Decreases may be actual (Blackburn, Bolton, etc.) or due to population moving outside the boundaries.

Note.—The 'conurbations' of Greater Manchester, Greater Liverpool, Birmingham and the Black Country, Tyneside, Leeds-Bradford, and Glasgow have all populations of over a million.

southern midlands. With the improvements mentioned there has been a considerable increase in trade.

Edinburgh has the advantage of having two seaports within its extended boundaries of 1920—Leith and Granton. Leith has an import trade in many respects similar to that of Hull, but serves (along with Grangemouth) in an even higher ratio than Hull as an inlet for sugar, butter, cheese, eggs, and other continental produce destined for the populous districts in the west. The exports are comparatively small.

THE IRISH REPUBLIC (POBLACHT NA H-ÉIREANN)

The Surface of Ireland. The larger part of Ireland is a plain, with greater stretches of nearly level country than are to be seen in any other part of the British Isles. The hills and mountains are chiefly near the corners of the island, and being from their nature thinly peopled, and not situated so as to separate more densely inhabited areas, present no serious obstacles to communication. The flatness of the country has facilitated the construction of both canals and railways. The Shannon, the longest river in the British Isles, is navigable from Lough Derg to the head of Lough Allen, that is, not far from its source; and it is connected by canals with Dublin by two routes, and with Belfast. The Shannon drops roughly 100 feet from Lough Derg to the sea at Limerick and advantage was taken of this fact to carry out the Shannon Power Scheme to supply electricity to the whole of the Irish Republic. The first part of the scheme was completed in October 1929. The effect of superficial configuration on the railway communications in Ireland is to be seen rather in the lengthening of routes than in enforcing the crossing of high altitudes on important lines. The most serious deviations from the direct route are those due to the highland country on the adjoining borders of the counties of Tipperary, Waterford, and Cork, the railway from Cork to Waterford being thus compelled to run first 21 miles north (to Mallow) out of a total of 96 miles, and that to Dublin 36½ miles north (to Charleville) out of a total of 165½ miles.

It is partly owing to the flatness of the surface in Ireland, but especially to the masses of boulder clay irregularly deposited when the ice sheets of the Great Ice Age melted, that the natural drainage is poor and the extent of bog and marsh land is so large, making up one-twelfth of the entire surface. In Ireland, too, the extension of bog and marsh is promoted by the fact that the situation of the island causes the climate to be particularly moist. The barren mountain land, woods, and water of Ireland being also deducted,

there remains three-fourths of the surface available for agriculture, including the rearing of livestock.

In respect of mineral resources Ireland is much less fortunate than Great Britain. Formerly the most productive coal-mines were those in the north of Co. Kilkenny, but the quantity produced there is small and of inferior quality. Small quantities of iron ore occur, but there are excellent resources of granite and marble.

Relatively to population, Ireland rears more livestock in the aggregate than any other country in Europe, and probably than any other country in the world, except 'new countries.' In certain species of livestock the ratio of numbers to inhabitants is greater in one or two other European countries, but not the ratio of all collectively. This ratio in the case of Ireland has, moreover, been growing on the whole for many years, especially in the case of cattle and poultry. Though the quality of the animals reared has been greatly improved with the help of timely and wise legislation, Irish cattle are still largely sent to England and Scotland as store cattle to be fattened. This is undoubtedly due in a large measure to the fact that Great Britain forms the chief market for the meat, and it is advantageous to fatten the cattle near consuming centres. Of recent decades, however, the value of fat cattle exported has approximated to that of store cattle. In the average quality of Irish butter and eggs great improvements have been effected through the agency of co-operative creameries and other societies, especially in the south and west of Ireland. The establishment of these societies was due to the efforts of Mr. (afterwards Sir) Horace Plunkett. With much difficulty he succeeded in getting the first established in 1889. Later many hundreds were established.

The establishment in 1922 under Treaty with Great Britain of the Irish Free State resulted in the publication of separate statistics which throw much interesting light on the trade between Ireland and Great Britain. The Irish Free State did not become a statistical unit for Customs purposes until after the setting up of a Customs frontier on April 1, 1923. At first the Irish Free State or Saorstát Eireann remained linked with the Commonwealth; later, as the Irish Republic, it became a completely independent republic. The area of the republic is approximately 26,592 square miles and the population was 2,972,802 in 1926, or 112 to the square mile. The population in 1946 was 2,953,265. In 1951 it was 2,958,878 and the downward trend was reversed for the first time for many decades. The density is still only 111 per square mile. It should be noted that the population of the whole of Ireland in 1841 was 8,175,000. The great famine which began in 1845 and caused huge migration to America started the general decline since. With this may be compared the area of Northern Ireland, 5,207 square miles; population (1926), 1,256,322, or 239 to the square mile. In 1951 the population

had increased to 1,370,709. In 1950 the total area under crops in the republic was 3,743,000 acres, of which hay occupied 2,296,000, oats 644,000, and potatoes 347,000 acres.

Before the separation of the Irish Republic it was only possible to form rough estimates of the trade between Ireland and Great Britain. First regarding exports; in the case of cattle and other livestock, butter and eggs, poultry, potatoes, and bacon and hams exported, it may be safely assumed that these were practically all of Irish origin and all found their final market in Great Britain; and it was interesting to compare the total Irish exports under these heads with the total imports of the same commodities into the United Kingdom. This showed that the value (though not the quantity) of eggs imported into Britain from Ireland was greater than that from any other single country, but butter was less than half that from Denmark.

Looking at the imports into Ireland, there was no difficulty in identifying the imported coal as all of British origin.

Taking the position as it was in 1908, as might have been expected, the bulk of the Irish butter sent to Great Britain was consumed on the west side of the island, whereas the principal markets of the Danish and other continental markets were on the east side. In all the large centres of population in Great Britain the best of Irish creamery butter was considered to be the best butter in the world. Although in later years great progress was made in the organisation of the dairying industry, Ireland continued to send over quantities of non-creamery butter, which is not the case with any other country supplying Britain. Danish butter reaches Great Britain in nearly equal quantities all the year round, whereas the Irish trade is concentrated in the six summer months, a fact which has had in various ways a prejudicial effect on the Irish trade. For that reason efforts were made to develop winter dairying. Ireland was keenly alive to the progress made in this respect by Denmark.

Taking the inter-war position, looked at as a whole the trade of the republic presented two noteworthy features. First, unlike that of the United Kingdom, it shows a marked predominance of food and drink amongst the exports. Second, the value per head is high. On the side of imports the value per head in Ireland is considerably higher than in the United Kingdom. The important place—some 45 per cent. in those years—occupied by manufactured goods amongst the imports is also noteworthy. Towards the end of the nineteenth century however the government determined on a policy designed to make the country a self sufficing unit and between 1929 and 1934 the trade between Britain and Ireland was halved. Even so 90 per cent. of the exports went to Britain and Northern Ireland, and Ireland despite development of hydro-electric power continued to need British coal.

IRISH REPUBLIC

GENERAL IMPORTS

	Percentages of Total Value.				
	1924.	1926-30.	1931-35. ¹	1938.	1951.
<i>Livestock</i>	—	—	1.9	2.0	1.5
Horses	—	2.1	1.5	1.9	1.4
<i>Foodstuffs</i>	—	—	30.7	29.2	24.0
Wheat and wheat products	10.8	10.2	7.6	7.5	4.5
Maize and maize products	6.4	5.6	4.4	5.5	2.9
Tea	3.8	4.1	4.1	4.0	3.5
Sugar	3.7	2.3	1.6	0.7	1.7
Bacon	2.8	2.9	0.8	0.2	—
Oilcake and fodder	2.2	2.0	1.2	0.8	0.3
<i>Raw materials</i>	—	—	19.6	17.1	17.0
Coal	6.4	5.6	6.5	8.0	6.0
Chemicals, drugs and paints	1.4	2.0	2.7	2.7	2.6
Petroleum	1.7	1.9	2.1	2.8	5.2
<i>Manufactures</i>	—	—	47.6	49.4	55.9
Apparel	6.4	7.3	5.5	2.3	2.0
Cotton yarns and manufactures	3.0	3.2	3.9	3.7	4.4
Woolen yarns and manufactures	2.3	2.6	3.1	3.0	4.0
Other textiles	—	2.1	3.1	3.2	4.7
Iron and manufactures	3.5	3.7	4.5	5.5	4.7
Other metals and manufactures	—	1.5	2.5	1.6	1.9
Machinery	1.6	3.0	3.7	7.5	8.5
Vehicles and parts	3.4	4.2	4.1	4.4	5.9
Paper and cardboard	1.6	1.9	3.0	3.0	4.2
Boots and shoes	3.0	2.4	2.4	— ³	— ³
<i>Total value in £m.</i>	64.5	58.6	40.6	41.4	204.4
United Kingdom	81.1	77.4	69.6	50.5	46.6
United States	5.4	7.3	4.4	11.4	12.6
Germany	1.1	3.0	4.0	3.6	2.3
Argentina	3.3	4.0	3.2	3.4	0.4
Canada	2.1	1.7	2.5	3.7	4.3
Belgium	—	—	2.3	2.7	2.2

SPECIAL EXPORTS

	Percentages of Total Value.				
	1924.	1926-30.	1931-35.	1938.	1951.
<i>Livestock</i>	—	—	45.1	49.5	37.4
Cattle	35.7	30.0	30.8	40.0	28.8
Horses	—	5.3	5.1	6.2	4.9
Pigs	2.4	4.8	3.2	0.9	—
Sheep	3.5	3.1	2.4	2.0	0.5
<i>Foodstuffs</i>	—	—	43.4	41.3	43.2
Stout, beer, ale	11.9	11.2	18.6	9.2	5.5
Butter	8.3	9.7	6.9	9.0	0.1
Eggs	6.4	6.8	5.9	4.9	3.3
Bacon	6.5	5.6	5.0 ³	9.2	0.4
Fresh pork	2.0	2.8	2.5	0.5	—
Poultry (dead)	1.7	1.6	2.0	1.8	5.0
<i>Raw materials</i>	—	—	4.4	5.2	8.2
<i>Manufactures</i>	—	6.6	0.0	3.7	10.2
Textiles (including apparel)	—	2.2	1.9	0.1	9.4
<i>Total value in £m.</i>	44.4	43.6	23.4	23.9	79.8
United Kingdom	98.1	95.4	94.4	92.5	84.0
United States	0.5	0.5	0.8	0.5	4.0

¹ Classes 1931-33. ² Figures not strictly comparable after 1932, because they exclude hams.³ Included in figure for Apparel.

Ireland has pre-eminently a climate suited to grassland and dairy farming rather than to the ripening of crops, and the policy of encouraging the growing of food grains has been only partly successful.

The chief Irish ports are Dublin (with Dun Laoghaire), Cork, Waterford, and Limerick.

TOWNS OF THE IRISH REPUBLIC, 1926 AND 1951

		1926	1951			1926	1951
Dublin	.	317,000	569,000	Waterford	.	28,600	29,000
Cork	.	78,000	75,000	Limerick	.	39,000	51,000

FRANCE

France is about two and a third times the size of Great Britain, but has a smaller population. Though the average density is much less, the population is more evenly distributed.

Surface. The greater part of northern France is made up of plains, gently rolling land, or broken hilly country offering little hindrance to communication. Lofty mountains—the Pyrenees (11,000 feet) and the Alps (up to 15,000 feet)—form the land frontier on the south and south-east. The only railways from France across the Alps are the line connecting the valleys of the Isère and the Dora Riparia by means of the earliest of the longer Alpine tunnels, the so-called Mont Cenis tunnel, opened in September 1871. Even the French Jura and the Vosges, in the east, are much higher than any British mountains, and obstruct to a considerable extent communication with the adjoining countries. The chief highlands within the French frontier are those of the so-called Central Plateau—really the south-centre—averaging from 2,500 to 3,000 feet. On the east they are bordered by the Cevennes, which sink abruptly down to the Rhone valley; farther west they are crowned by the remains of the old volcanoes (the *puy*s) of Auvergne; and they are traversed by profound river valleys opening to the north and west. The climate of the surface is bleak and the soil unproductive, but this is partly compensated by the richness of some of the valleys, notably the expansion of the valley of the Allier called the Limagne (around Clermont-Ferrand), which the volcanic dust blown thither by the prevailing south-west winds from the mountains of Auvergne has helped to make one of the most fertile tracts of France. Altogether, the Central Plateau is a sparsely peopled region, but even its most thinly peopled districts are to be compared rather with the less populous parts of Wales and the north of England than with the highlands of Scotland. The level tract between the Adour and the Garonne in the south-west, embracing the maritime dunes of the Landes, contains even less fertile land than the Central Plateau, and here also population is scanty and railways are wide apart. Corsica is highly mountainous, and, like other mountainous islands, has its population chiefly on the coast.

Rivers and internal navigation. France has close on 6,000 miles of navigable waterways against the United Kingdom's 4,600 miles, and their relative importance is much greater than this comparison would suggest. Even the shortest of the great French rivers, the Dordogne, is longer than the Thames; and the Seine (with its tributaries, the Oise, Marne, Aube, and Yonne), the Loire, Dordogne and Garonne, and the Saône, the chief tributary of the Rhone, as well as minor rivers, flow through plains and valleys presenting few obstructions to navigation for the greater part of their courses. The impetuous Rhone, though navigable from Lyons, has its course impeded by sandbanks and other obstructions. A section of the Rhine forms part of the eastern frontier. The importance of the navigation naturally afforded by the rivers is shown by the canal connections between them, especially in north-eastern France. The Marne and Rhine Canal (178 locks), which crosses the northern end of the High Vosges at the height of about 1,100 feet and unites the Rhine navigation to that of the Seine, begins at a point on the Marne about 300 miles above the mouth of the Seine. A branch running north connects it with the Saar navigation, and so with the Saar coal-field. The Burgundy Canal (189 locks), which connects the navigation of the Seine and Rhone by means of the Yonne and Saône, begins on the Yonne at a point about 275 miles above the mouth of the Seine, and ends on the Saône rather more than 300 miles above the mouth of the Rhone. It crosses the Côte d'Or at the height of 1,230 feet, and passes Dijon. The Canal du Centre (69 locks) connects the Loire, about 400 miles from its mouth, with a lower point on the Saône, passing to the north of the Central Plateau at a height of about 1,000 feet at the summit. The Rhone and Rhine Canal (174 locks) quits the Saône near the point of entrance of the Burgundy Canal, and enters the Rhine valley through the opening known as the Burgundy Gate, between the southern end of the Vosges and the western slopes of the Jura. The Canal du Midi (81 locks) connects the Garonne at Toulouse with the Mediterranean at Sète (formerly Cette), traversing at the height of 625 feet the Passage of Naurouze or Gap of Carcassonne, between the Central Plateau and the Pyrenees. Accessible only to barges of 100 tons, it now carries very little traffic. The Marseilles-Rhone Canal, 10 feet deep, opened during the First World War, passes through a tunnel more than $4\frac{1}{2}$ miles long.

The accompanying map shows the inland waterways of France, distinguishing between first and second class, those of the first class having a minimum depth of $6\frac{1}{2}$ feet and locks of at least 126 feet in length and 17 feet in width. It makes clear the concentration of first-class inland waterways in north-eastern France, where the flatness of the country favoured canal construction and where there is a large amount of heavy traffic connected with the Belgian system.



FRANCE: INLAND WATERWAYS
Also the principal navigable waterways of
BELGIUM AND THE NETHERLANDS

It shows also the rivalry that must exist between the French port of Dunkerque (Dunkirk) and the Belgian port of Antwerp in connection with that traffic. All the north of France east of 4° E. is in fact nearer Antwerp than Dunkirk by water. The important position occupied by Paris in relation to water traffic is also made clear. It is estimated that not much less than half the quantity of goods brought into Paris comes by water; indeed, judged by this traffic, Paris is the premier port of France. In 1938 the weight of merchandise entering or leaving the capital by water was 50 per cent. more than that credited to Marseilles.

As regards **climate**, France has all the advantages of a westerly maritime situation, together with a more southerly latitude than the British Isles. The greatest contrasts of climate within a short distance are those between the south-west with its prevalent north-westerly winds of summer, bringing copious summer rains favouring the growth of maize, and the south-east with its typical dry Mediterranean summers, utterly unsuited for maize, but favourable to wine and fruit, as well as wheat. The Provence plain is exposed, especially in winter, to the violent cold northerly wind known as the mistral; the neighbouring Riviera (Nice and Cannes) is not so exposed.

Crops. Under one-fifth of the surface of France is occupied by mountains, about a fourth by plateaus. This leaves more than one-half for the lowlands, which, though not everywhere fertile, contain a large proportion of fertile soil. Relative to size, there is no great difference between France and Britain in the extent of cultivated land, counting both arable and pasture, but excluding rough grazing. True comparative figures are hard to determine, but prior to the Second World War France's cultivated area might be put at 76m. acres against Britain's 30m. acres, or about two and a half times as large, whereas the whole country is two and a third times as large. During the war these proportions came to agree still more nearly. But there is this important difference between the farmlands of the two countries: pastures are a much bigger proportion of the cultivated area in Britain than in France, and France has a much bigger proportion of arable land. Apart from the disparity in the acreage of fruitlands, especially vineyards, France's area under corn crops—wheat, oats, barley, rye, and maize—in 1950 was nearly three times the corresponding area in Great Britain. On the other hand the average yield of the British crops was higher, and France's total production was less than twice that of the United Kingdom.

The corn crops have been listed in the order of their importance in France. Wheat is easily first; it accounts for more than fifty per cent. of the aggregate area and yield of French corn crops. Outside Russia, France is normally the biggest wheat-producing country in Europe. As in this country, production in recent years

has been subject to abnormal fluctuations, due not only to seasonal differences but to war reactions. In general, France may be said to have had four to five times the British area under wheat, and three to four times the production. It should be noted that the French grow wheat for their own consumption all over the country, and not only in the areas most favourable to high yields.

Rye and buckwheat are grown principally on the poorer soils of Brittany and the Central Plateau.

Besides corn-crops France produces all the ordinary British green-crops, potatoes and mangold; the vine still covers, notwithstanding the devastations of the phylloxera, an area as large as that occupied by wheat and barley together in the British Isles; the sugar-beet acreage greatly exceeds the British acreage of that crop; and large areas are occupied by olive-groves, mulberry trees, for the rearing of silkworms (less important than formerly), colza, hemp, and flax, while tobacco is likewise a product of no little importance. Of great significance now are 'primeurs,' or early fruits and vegetables, many of which are exported to the United Kingdom.

The leading French **fisheries** are mentioned elsewhere (p. 252). Extensive government subsidies are given for the development of the deep sea fisheries.

The **mineral wealth** of France is of considerable importance. France has several small, and not very productive, coal-fields, scattered over different parts of the country, notably the central region, and one major field in the north of the country. The central fields are farthest from supplies of sea-borne coal and valuable on that account. The northern coal-field is a continuation of that of Belgium, and the chief centres of production are Lens and Anzin. Next in productiveness are those on or near the eastern side of the highlands which border the basins of the Rhone and Saône on the west—round St. Etienne in the middle, round Le Creusot farther north, and at Alès in the south. An extension of the Saar field into Lorraine has some importance. The main French coal-fields have been nationalised; production is 50–60m. tons and there is a net import of a few thousand tons.

The production of **iron ore** in France has increased remarkably. The principal producing district has long been in the north-east in the basin of the Moselle, near Nancy and Longwy, but the most productive part of that district, with Briey as its centre, was unknown till the eighties of last century, and various difficulties retarded development for some time after the deposits became known. It is necessary to obtain coke from either Germany or Belgium. The ores are phosphorous ores containing from 28 to 40 per cent. of iron and from 8 to 16 per cent. of lime, of the same character in fact as the ores of the neighbouring deposits in the Metz-Thionville basin, which were retransferred from Germany to

France at the Treaty of Versailles. In 1950 Lorraine accounted for 94 per cent. (28m. tons) of the French production of iron ore. (See also under Germany, p. 417.) Other deposits were for long worked near Le Creusot, and more important deposits were later opened up in the west, especially in Normandy, near Caen. There has also been a certain production of Bessemer (non-phosphorous) ores in the eastern Pyrenees, on the north-west and south-east slopes of Canigou.

The potash deposits of Alsace, a little to the north-west of Mulhouse, are next in importance to those of Prussian Saxony. Between the two World Wars, the Alsatian production of crude potash salts rose from 350,000 tons (1913), yielding 65,000 tons of potash, to 3½m. tons (1939). In 1946 the production of crude salts still stood at 3½m. tons (with a yield of 520,000 tons of potash), and in 1948 production of the crude salts rose to nearly 4½m. tons. Just before the Second World War, potash was found near Dax, in south-west France, but the mines in the Dax region are still in the experimental stage, and there are no available statistics of production, which is negligible compared with the quantities mined in Alsace. Total potash production in 1950–51 was nearing a million tons.

Sea-salt is obtained from salt-pans on the western Mediterranean coasts and on the coasts of the Bay of Biscay; rock-salt near Nancy, in the north-east.

Since about the end of last century much has been done to develop what the French call 'white coal,' that is, water-power, which is furnished in great abundance, especially by the Alpine torrents. Before the Second World War, the annual production was nearly 12,000m. kwh., and though it declined somewhat during the war, new and important installations have since led to a target figure of nearly 22,000m. kwh. in 1953. The Rhine, Rhone, Isère, Romanche, Drac, Durance, and Dordogne are among the rivers which have been harnessed in this way. Apart from domestic uses, electricity is largely used as the motive power on the French railways, as well as for industrial purposes, notably in the electro-chemical industry and electro-metallurgy.

One consequence of the dispersal of the French coal-fields is the fact that localisation of the great French **manufacturing industries** is governed less by the supply of fuel than by the supply of raw material, and the conveniences for obtaining supplies from abroad and marketing the product.

The earliest centre of the iron industry was Le Creusot, which, while the industry was still small, was favourably situated in respect of all the bulky raw materials. It is still noted for the making of machinery, locomotives, and other railway material, as well as other important branches of the iron and steel manufacture, in-

cluding the Schneider armament works now taken over by the government. There are important engineering works at Lille, St. Etienne, and Paris. Since the development of the Brie y basin a great iron industry has grown up there; indeed, a great iron and steel industry has developed on the whole of the Lorraine iron-fields. Pig-iron is made from local ores near Caen. In general, the French steel industry made a quick recovery after the Second World War, and had as an early target an annual production of 12½m. tons in 1952-53; in 1952 it was nearly 11m. tons.

In 1951 France took the initiative in establishing, in conjunction with Belgium, Germany, Italy, Luxembourg, and the Netherlands, a European Coal and Steel Community which aims at providing a single market for coal and steel in the member states, available to all buyers on the same terms.

Paris, like London, is too large to be specially identified with any particular industry, but is the seat of a large number, more particularly those producing articles of luxury. Jewellery and perfumery, furniture, porcelain, fancy wares, glove-making, and the making of fashionable clothing and footwear are all notable Parisian trades. The manufacture of the celebrated Sèvres porcelain, established as a State industry in 1756 in the historic town from which it derives its name, on the western outskirts of the capital, was transferred in 1876 to the neighbouring Park of St. Cloud. The central position of Paris in the great northern plain of France, just below the junction of the Marne and the Seine, has been in favour of its acquiring and retaining the rank of capital, and it is without a rival in France in trade and population.

The woollen industry is chiefly carried on in the north. Only about 10 per cent. of the wool used in the factories comes from sheep native to the country; the French flocks are no longer important except in the Causses (the limestone plateaus bordering the Cevennes), the southern Alps, and the region of the Pyrenees. The great bulk of the wool for manufacture comes from the Argentine and Australia, through the ports of northern France. In the north also are easily accessible coal supplies, and the seats of the industry are intermediate between two of the most important markets in the world for woollen goods—London and Paris. The great market for raw wool is the Roubaix-Tourcoing area, which vies with the two other leading continental markets for wool—Antwerp and Hamburg. The centres of the French woollen manufacturing industry are, first, the northern area already mentioned, embracing Roubaix, Tourcoing, and Fourmies; then Alsace (Colmar, Sainte Marie aux Mines—the German Markirch—and Bischwiller), followed in descending order of importance by Elbeuf, Louviers, Sedan, Rheims, Vienne, and Mazamet. Carpets are included among the manufactures of Roubaix-Tourcoing. Elbeuf, on the Seine

above Rouen, and Louviers, a little to the south-east, are noted for their woollen (as distinguished from worsted) cloths. In Sedan the woollen industry was early fostered by the sheep-pastures of the Ardennes. Rheims lies beside the sheep-pastures of Champagne, a region similar to the English Downs. Troyes, on the upper Seine, has long been noted as the chief seat of French hosiery.

Mazamet, in the south, specialises in the import of sheep-skins with the wool still attached, coming, for instance, from the Argentine, where the sheep have been slaughtered for their meat. It is perhaps the leading town in the world for the removal of the wool from such skins. Woollen stuffs are woven in the neighbouring factories of Castres and Lodève, and the skins are dressed for leather at other neighbouring places, such as Graulhet.

The advantages for textile manufactures in the extreme north are not confined to woollens. Linen and cotton manufacturing industries are of outstanding importance in Lille, the largest manufacturing town in the district, and in the neighbouring town of Armentières, on the Lys. The linen industry is favoured by the excellent flax produced in the Scarpe and Lys valleys (see p. 391), and by the proximity—across the Belgian frontier—of Courtrai, the great continental market for linen. To the south-east of Lille, on the Escaut, stands Cambrai, which gives its name to cambric and is famed for fine linens.

In the cotton industry the restoration of Alsace to France has given that part of the country once more the leading place. Textile manufactures as a domestic industry had long been carried on in the hamlets of the Vosges valleys, and these supplied much of the labour required under modern conditions. Calico printing was started at Mulhouse as early as 1746, and this led to the establishment of cotton spinning and weaving in which steam power began to be used in 1812. Colmar, Guebwiller, and other places in the neighbourhood, where power afforded by the torrents of the Vosges can be used to supplement steam, are also engaged in the industry. After the transference of Alsace to Germany in 1871, cotton factories were established at Sénones, St. Dié, Epinal, and other places west of the Vosges; but outside of Alsace the cotton manufacturing towns of Normandy, and above all Rouen, are pre-eminent. Further north the chief centre of the industry is St. Quentin, to the south of Cambrai. Another important centre is Roanne on the Loire.

The silk manufactures still have their chief seats in the valley of the Rhone, where the silkworm was first introduced into France. Lyons, the third town in France in point of population, birthplace of the inventor of the Jacquard loom, is the town whose name is most intimately associated with this industry in all its branches. It lies at the confluence of the Saône and Rhone, partly on the left bank of the latter river, partly on a small alluvial flat between the

two, and immediately overlooked by the hills which skirt the right bank of the Saône. Next in importance to Lyons in connection with this industry is St. Etienne, which supplies Lyons with coal. Both it and Lyons have excellent water for dyeing. The textile industries of the lower Rhone valley, the southern Jura, the Alps, and the upper Loire basin may be regarded as tributary to Lyons.

Limoges, on the Vienne, is noted for its porcelain and earthenware. Both coal and kaolin are obtainable at no great distance, though they lie in different directions from the town. Glass is made on or near the coal-fields of the north and centre, generally in the immediate vicinity of fine sand; paper at Angoulême in the west, and Annonay in the east; watches at Besançon in the Jura, though the chief industry of this last town consists mainly in putting together parts of watches made in the Swiss Jura. The manufacture of kid gloves is carried on in nearly every village within a radius of forty miles of Grenoble in the Alpine valley of the Isère. Strasbourg carries on a variety of manufactures, and is also important as an administrative and commercial centre. The completion in 1907 of works designed to make it a great river port stimulated its industrial activity; and notwithstanding the barrier placed between it and its most accessible large market by the change of frontier made in 1919, the total traffic continued to grow rapidly. It is now the headquarters of the Council of Europe.

The principal French **seaports** in the order of their importance (by tonnage of traffic) are Marseilles, Le Havre, Cherbourg, Rouen, Bordeaux, Dunkerque, Calais, Dieppe, Port-de-Bouc, Nantes with its outport of St. Nazaire, and La Rochelle with its outport of La Pallice.

The priority of Marseilles, distant as it is from the capital and the great northern seats of industry, is due to the fact of its being the only first-class port on the Mediterranean Sea. The Rhone delta itself is too marshy, the mouth of the Rhone too much encumbered by sandbanks, to afford a favourable situation. Marseilles was founded at the nearest place on the coast with suitable conditions by Greek colonists from Asia Minor as early as 600 B.C. It has been a great seat of commerce and shipping ever since. The Rhone valley, besides being itself rich and productive, affords access not only to the plains of northern France and Belgium through the valleys of the Loire and the Seine tributaries, along the routes indicated by the position of the canals already named, but to the Middle Rhine valley by the Burgundy Gate between the Vosges and the Jura, and to the tableland of Switzerland by way of Geneva through the narrower opening between the Jura and the Alps. The advantage of some of these connections was considerably reduced by the piercing of the Alps by railway tunnels, and especially by the construction of the St. Gotthard tunnel, which gives to

Genoa a shorter route to Antwerp than that from Marseilles; but within France there is no railway route on which the gross receipts per mile are so great as on that from Marseilles to Paris. The position of Marseilles causes its trade to be chiefly with the Mediterranean and the East, and this is one of the ports benefited by the opening of the Suez Canal. Among its chief imports are wine, wheat, oil-seeds, sugar, coffee, hides, silk, pepper, and other Eastern products. Among its local industries may be mentioned particularly the refining of oil and the making of soap, stimulated by the local supplies of olives and the import of olives from Italy and of various oil-seeds from India and the East generally, as well as from Africa. There is also a large manufacture of macaroni from hard wheat imported from Italy. Marseilles is the headquarters of the great steamship company the Messageries Maritimes, which carries on an extensive commerce with the East and the Pacific. Moles are constructed parallel with the coast and connection is made by the Rove canal tunnel with the Etang de Berre, which may now be regarded as an annexe of the port.

Sète, on the west of the Gulf of Lions, has mainly a local importance through being the terminus of the Canal du Midi. At present Marseilles has only Genoa as a rival on the Mediterranean. It was not so in the Middle Ages. Even then Marseilles ranked first, but the ships of Arles on the Rhone were to be seen side by side with those of Marseilles in the most distant parts of the Mediterranean. Narbonne continued to be an important port till the fourteenth century, but in 1320 a breach in the embankment of the Aude caused that river to leave the town, which the Robine branch of the Canal du Midi did not serve to restore. Aiguesmortes, in virtue of a canal connecting it with the sea, was once a great resort of maritime shipping, and lingered on as a seaport till Sète was fixed upon as the eastern terminus of the Canal du Midi, which was opened in 1681. Then the efforts to fight against the deposits of sand and silt (ceaselessly brought by currents with a westerly set to the Languedoc coasts of the Mediterranean) were abandoned, and Aiguesmortes was allowed to fall into decay. The port of Sète requires constant attention to preserve it from the same fate.

The commerce of France on the western and north-western coasts is in the aggregate much greater than that on the Mediterranean, but it is divided among a greater number of large seaports, which are recovering from the damage inflicted on them in the Second World War. Havre, or Le Havre, at the mouth of the Seine, founded in 1509 by Louis XII, has grown to be 'the haven' of Paris since its harbour was extended and improved by his successor Francis I, and since the elder seaport of Harfleur, a little higher up, declined through the silting up of its harbour. It is the chief seat of trade with America, and hence the chief place of import of North American

cotton, tobacco, wheat, animal produce, etc., and of South American coffee, for which it is now the principal European *entrepôt*, a position which is favoured by the possession of a highly organised market, though this again may be regarded as a natural growth at a port which is at once the most favourably situated for supplying one of the largest consuming countries in Europe, and the first touched at on the routes to the other large markets further north. Steps have been taken for large port installations at Honfleur on the south side of the estuary of the Seine. Since 1887 the Tancarville Canal has afforded direct communication between the ports of Havre, Harfleur, and the Seine, thus enabling smaller vessels to avoid the dangerous navigation of the estuary of the Seine. Rouen has since the same date taken away some of the trade of Le Havre; it has been made into a first-class port by the deepening and straightening of the Seine, and vessels drawing as much as 22 feet can lie afloat alongside parts of the quays.

In the north Le Havre has been exposed to the keen rivalry of Dunkerque or Dunkirk, the only French port on the North Sea, a port which before the Second World War was the most rapidly rising of all French ports, in consequence of its being so favourably situated for the supply of the northern manufacturing towns with their imported raw materials (above all, South American wool), and for the export of their manufactured products, including iron, beetroot-sugar, and oils. Its harbour can accommodate vessels up to 600 feet in length with a draught of 30 feet.

Bordeaux, on the Garonne, a little above the place where the estuary of the Gironde is formed by the confluence of the Dordogne, has long been the chief place of export of French wines. For vessels of the largest class it has an outport in Pauillac, on the left bank of the Gironde. On the same bank of the Gironde, at the very mouth of the estuary, was an up-to-date marine station—Verdon—where big liners could embark or disembark passengers and baggage without the delay of going to Bordeaux; but this was put out of action during the Second World War. La Rochelle, as the outlet of the middle parts of western France, has acquired importance chiefly since the inauguration in 1891, about 3 miles to the west, of its outport of La Pallice with accommodation for large vessels. St. Nazaire, at the mouth of the Loire, like Pauillac, grew in importance through the introduction of large shipping, and also through the silting up of the Loire at Nantes. It is capable of accommodating ships of the largest size, and is famed for its shipbuilding yards. Here was built, before the Second World War, the then largest steamer in the world, the *Normandie* (p. 94). Nantes, after being almost closed to sea-going vessels, has been restored to the position of a considerable seaport by the construction of a ship canal admitting vessels up to a draught of 22 feet. The Loire below Nantes

has been dredged, so increasing the scour of the river that large vessels can now go up to Nantes. Cherbourg, on the northern peninsula of Normandy, has obvious advantages, similar to those of Southampton, as a calling-place for trans-oceanic steamers.

The five naval stations of France are Cherbourg, nearly opposite Portsmouth; Brest and Lorient, in Brittany; Rochefort, south of La Rochelle; and Toulon, on the Mediterranean. At all of these are government dockyards, and there are private shipbuilding yards at all the chief commercial ports.

Of the inland towns of France not connected with any special industry the most worthy of mention are Toulouse, on the Garonne, at the confluence of the Canal du Midi; Orleans and Tours, on the Loire; Angers, at the confluence of the Mayenne and Sarthe. Dijon and Macon are important centres of the trade in burgundy wine, Rheims and Epernay of that in champagne. Strasbourg is the great centre of the Rhine valley (p. 387).

The rapid industrial development of France after the First World War, partly at the expense of agriculture, and some of the subsequent fluctuations, are shown by the following figures:

Year.	Raw materials imported.		Manufactures exported.		Wheat acreage.	Males working on the land.
	Million metric tons.		Million metric tons.		Millions.	
1913	37.16		2.28		16.0	5.3 (1911)
1923	47.71		3.04		13.7	3.9
1938	39.68		3.89		12.5	—
1947	31.36		2.80		8.2	4.1 (1946)

Overseas Trade. The depreciation of the French franc since the First World War makes comparison of the trade returns over a period of years deceptive. In 1951, when the exchange value of the franc (once 25 to the £) stood at 980, special imports (i.e. for home consumption) were valued at 1.5 million million francs (over £1,500 m.), and special exports (i.e. of home products) at 1.4 million million francs (over £1,400m.). Of the imports, food and drink accounted for 20 per cent. and manufactures for rather more, but well over half were non-edible crude materials. On the other hand, manufactured goods provided about two-thirds of the exports, food and drink roughly dividing the balance with crude materials. The chief countries of supply were the United States, Arabia (a comprehensive term covering the various Arabian oil-producing states), Germany, Algeria, Belgium-Luxembourg, and Australia. The best customers were France's overseas territories and associated states, together with the United Kingdom, Switzerland, the United States, Belgium-Luxembourg, and Germany.

CHIEF TOWNS OF FRANCE: CENSUS POPULATIONS IN THOUSANDS

	1936 Thousands.	1946		1936 Thousands.	1946
Paris . . .	2,830	2,725	Strasbourg . . .	193	176
Marseilles . . .	914	636	Toulon . . .	150	126
Lyons . . .	571	461	Rennes . . .	99	114
Toulouse . . .	213	264	Nancy . . .	121	113
Bordeaux . . .	258	254	Rheims . . .	117	111
Nice . . .	242	211	Clermont-Ferrand . . .	101	108
Nantes . . .	195	200	Rouen . . .	123	108
Lille . . .	201	189	Le Havre . . .	164	107
St. Etienne . . .	190	178	Roubaix . . .	107	101

BELGIUM¹

The surface of Belgium is made up, in the west and north, of low flat plains, partly below sea-level, succeeded by low undulating land which rises in the south-east to a tableland (the Ardennes) intersected by deep river valleys. Between these two main physical regions, the lowlands and the highlands, lies the long narrow coal-field. The plains afford admirable facilities for inland navigation by both river and canal, and these facilities are continually being improved.

Though only about one-eighth the size of Great Britain the population is about one-sixth. The high density (734 to the square mile in 1950) is fairly evenly distributed. Only the Province of Luxembourg, in the south-east, on the tableland of the Ardennes, has a density of population low enough to be compared with that of the English county of Hereford. Another district of low but rising density is the Campine, on the north-east—a sandy plain, formerly heathy or marshy, but now partly reclaimed, and rapidly becoming an industrial region centred around a relatively new coal-field. This high density of population is due, as in England, both to advanced agriculture and to the great development of manufacturing industries. Two languages are spoken by the bulk of the population—Flemish (virtually Dutch) by those living north of a line drawn from the south of the province of West Flanders to the north of that of Liège, French (Walloon) by those south of the line.

Two-thirds of the surface is agricultural, of which arable land is about 55 per cent. The principal arable crops are wheat, rye, oats, and sugar-beet, while industrial crops such as tobacco, flax, hops, and chicory are highly characteristic of some areas, particularly Flanders. Flax is mainly grown in the basin of the Lys, a tributary of the Escaut (Scheldt), and the excellent linen obtained from it has long been held to be due to the remarkably soft water of that river, which is well suited to cleansing and retting the fibre.

¹ Thanks are due to Professor K. C. Edwards for comments on the Benelux countries.

The centre of this trade is Courtrai. Forests, amounting to 18 per cent. of the surface, occur chiefly in the Ardennes.

At the last agricultural census of Belgium 36 per cent. of the surface in cultivation was cultivated by the owners themselves. Most of the landed properties are small, but small farming is even more general than small property-holding, the size of the majority of the holdings being about as small as those on the plains of Bengal. Productivity per acre is very high, but except in the rich polders or embanked areas, reclaimed from the sea, this is not due to natural fertility so much as to centuries of careful, intensive tillage and manuring.

The mineral wealth of Belgium consists chiefly in coal. The coal-fields fall into two main divisions. The more extensive occupies the valleys which intersect the Belgian plateau from the eastern frontier near Aachen (Aix-la-Chapelle) to about the middle of the Franco-Belgian frontier, the principal valleys in this respect being those of the Sambre and that part of the Meuse valley which continues the line of the valley of the Sambre. Geologically, this strip is formed by a series of carboniferous strata lying on the north-western margin of a Devonian plateau which extends eastwards into Germany. There are important areas of production round Mons (the Borinage district), Charleroi, Liège, and in between these cities; altogether the production of coal in the division averaged nearly 23m. tons in 1936-38, and was over 20m. tons in 1952. The other main division of the Belgian coal-fields is in the Campine, ranging westwards from Dutch Limburg to near Antwerp, through a length of about 50 miles with a width of about 7 to 12 miles. Production, which began in 1917, increased to an average of 6½m. tons a year in 1936-38, and nearly 10m. tons in 1952. The chief mining centre is Genck, around which are seven collieries. Much of the coal is 'long flame,' well adapted for use in glass and pottery making.

It will be seen that Belgium's total production of coal averaged 29m. tons in 1936-38; it reached over 30m. tons in 1952. Relative to the size of the two countries, this is comparable with the British output and is a measure of the importance of coal in the Belgian economy. But Belgium has no other minerals of large importance. Former deposits of zinc have been exhausted; deposits of lead are negligible. Despite this, important non-ferrous metal industries still flourish, using Congo and other ores. Some iron ore is produced in the Belgian Lorraine field, but 98 per cent. of the ore used by the iron and steel industry is imported—chiefly from France, but also from Sweden, Algeria, and Spain. Excellent glass sands are found, especially in the Campine and around Charleroi. Among other mineral resources are brick and pottery clays (notably around Boom, on the Rupel, between Brussels and Antwerp)

and various stone quarries, including marble. Belgium is an original member of the European Coal and Steel Community (p. 385).

Manufactures are numerous and varied. It is a moot point whether the textile industries or the heavy industries are the more important. Cotton, woollen, and linen yarns and fabrics figure largely among the exports. The woollen industry owed its origins to the sheep pastures of the Ardennes and has since been fostered by the large supplies of wool from the River Plate; linen manufactures are still benefited by the natural advantages, already noted, which Belgium offers for flax-growing. The spinning and weaving of linen are carried on chiefly at Ghent, Tournai, Courtrai, and other western towns (in Flanders) in or near the flax-growing region; but the linens of Courtrai are not made entirely from the fine fibre of native production, but from coarser material formerly imported from Russia, and now mainly from France and Holland. The town most noted for its woollen cloth is Verviers, which lies close to the Ardennes and the coal supplies of Liège; formerly the River Vesdre provided power, and is still a source of soft, lime-free water. Ghent is the centre of the cotton manufactures. Brussels, the capital of the country, has numerous industries, but is not specially a manufacturing town, though it may be mentioned here on account of its lace. The sixteenth-century Wilhelms Canal has been so far improved as to allow of small sea-going vessels and 2,000-ton river barges reaching Brussels.

Verviers presents a remarkable instance of the persistence of an old industry, its woollens having been noted as far back as 1432. It also exports very large quantities of woollen yarn, or a hybrid between woollen and worsted yarn, and of washed wool, the last branch of the industry being due to a local advantage turned to account by science and common sense. A committee having ascertained that the presence of lime in water is prejudicial to the scouring of wool, an abundant supply of water free from lime was obtained by building a dam across a small stream in the neighbourhood which flows over slate and sandstone.

First in importance among the 'heavy' industries are the making of steel and of machinery. These are localised chiefly around La Louvière, Charleroi, and Liège (with its suburb of Seraing). The situation of Liège is highly characteristic of the eastern towns of Belgium generally. The antiquity of the place is shown by the fact of its having been known to the Romans under the name of *Lugdunum Batavorum*, and during its whole history it has been an important centre of trade. For centuries it has been famous for the manufacture of firearms. It lies, like Namur, Verviers, Huy, and other important towns in the east of Belgium, in a narrow valley of the south-eastern plateau; but it lies at an important nodal point. At Liège the valley of the Meuse begins to open out so as

to afford free communication in various directions towards the west and north; the valley of the Ourthe, which here joins the Meuse, opens a way to the south through Belgian Luxembourg; and the valley of the Vesdre, which joins the Ourthe just above its confluence with the Meuse, leads eastwards by way of Verviers and Aix-la-Chapelle into Germany. The position of Liège may be compared with that of Manchester and Leeds—all the more nowadays when the neighbouring supplies of coal are so important.

Other important industries include glass, chemicals, electrical engineering, paper, rubber, leather, building materials, and diamond-cutting.

Although Belgium was the second European country, after Great Britain, to become industrialised, the tradition of hand labour remained strong until near the end of the nineteenth century, especially in textiles. As late as 1896, in cotton and woollen weaving, 46 per cent. of all employees worked on hand looms, and in linen, 61 per cent. In the present century, mechanisation and modernisation have proceeded apace, especially during the reconstruction period after the devastations of the 1914–18 war. To-day, Belgium is one of the most highly industrialised countries in the world, with, in 1951, 51 per cent. of her occupied population in industry. Her prosperity, like that of the United Kingdom, depends essentially on the import of large quantities of raw materials, and the export of manufactures.

An important factor in the further development of Belgian commerce is the project for the economic union of the Low Countries. Belgium and the Grand Duchy of Luxembourg entered into such a union in between the two World Wars, and in 1944 they signed an agreement with the Netherlands Government to work out an economic union of the three countries. From their names has been coined the popular designation Benelux (Be-ne-lux). As a first step their Customs tariffs were unified in 1948, and Customs duties on trade within the Union were abolished, though import licensing remained. The free circulation of goods and currencies between the three countries is planned to follow. Complete economic union may take some years. Apart from the direct benefit to trade, two examples of the effect of this development on commercial relations may be noted. In the past there has been great trade rivalry between Antwerp and Rotterdam. Under Benelux a joint committee has been set up to regulate port rivalry. From the Belgian standpoint, it has been a weakness of Antwerp's position that the lower course of the Scheldt is bounded on both sides by Dutch territory. Benelux will largely do away with that weakness by guaranteeing a policy of co-operative trade enterprise.

For the distribution of the products of its industry, and the reception of products of other countries, few countries on the Euro-

pean mainland have greater natural advantages than Belgium. The flatness of a large part of the country long ago permitted light railways, making use of the roads, to be an important auxiliary in inland transport. On the land side, Belgium lies close to some of the most populous parts of the surrounding countries, and in Antwerp it possesses a seaport vying in situation with that of London.

Like London, Antwerp lies on a tidal river, the Scheldt, at the head of a deep estuary. It stands on the right bank of the river, 55 miles from the sea. It has the advantage over London of having a much more extensive and capacious system of inland navigation subsidiary to its transmarine commerce. It is connected by first-class waterways with the Meuse, Seine, and Rhine, this last being reached by the channels between and across the islands of Zeeland. Thus the port has a large share in the transit trade of Belgium. A scheme, long advocated, for a more direct water route to the Rhine has been partly realised in the Albert Canal, almost complete just before the Second World War. This canal runs from Antwerp east to Herentals, thence near Genck, in the Campine coal-field, and near Maastricht, in the Meuse valley, to Liège, which is now accessible to 2,000-ton barges. Proposals have been made to continue the canal eastwards from Maastricht to the Rhine *via* München Gladbach, or *via* Aachen.

Being the nearest great port to the principal manufacturing region of Germany, Antwerp is also the chief outlet for that region for goods requiring railway transport, and this fact has greatly contributed to the modern development of the port. In 1887 the tonnage of the shipping entering from the sea was under 4m.; in 1913 above 14m., in 1938 nearly 24m., and in 1948, despite the effects of the Second World War, nearly 21m. There are close on 30 miles of quays and 1,000 acres of docks (water area). The port is admirably provided with handling apparatus, including floating pneumatic corn elevators, each capable of transshipping 200 tons of corn per hour into lighters.

Ghent, at the confluence of the Lys and Scheldt, was made a seaport in the modern sense in 1886 by means of a ship canal from the estuary of the Scheldt at Terneuzen, admitting vessels of 2,500 tons burden (17½ feet draught). Further deepening to nearly 29 feet has made it accessible to vessels of 10,000 tons at the present time. Ostend, which lies amongst the dunes on the west coast, is the only other Belgian seaport of importance; but Bruges, one of the older rivals of Antwerp, did not benefit as much as was hoped from the opening, in 1900, of a canal to the sea with a depth of 26 feet 3 inches. Its outport, Zeebrugge, with a large artificial harbour, achieved an unexpected importance during the First World War, and is the eastern terminus of the important Harwich-Zeebrugge

train ferry (for cargo only) which handles large quantities of perishable food imports and manufactures bound for Britain.

Overseas Trade. As a result of their Customs Union, Belgium and Luxembourg constitute a trade unit. In 1951, when the Belgian franc had an exchange value of 140 to the £, special imports into Belgium-Luxembourg were valued at 126,412m. francs (£903m.) and special exports from the two countries at 132,365m. francs (£945m.). Food and drink accounted for about one-sixth of the imports, and the balance was divided more or less equally between non-edible crude materials and manufactured goods. Manufactures formed an overwhelming proportion (about 80 per cent.) of the exports, food and drink providing only about 5 per cent. and raw materials the balance. The leading countries of supply were the United States, the Netherlands, France, Germany, the United Kingdom, and the Belgian Congo. Exports were consigned mostly to the Netherlands, the United Kingdom, France, the United States, Germany, the Belgian Congo, Sweden and Switzerland. In both cases the countries named accounted for nearly two-thirds of the trade, and are listed in descending order of value.

Towns. The official population of the Belgian town is the population of the commune, which in general is a fair indication of the size, most of the towns being provincial centres set in rural districts. Linked on to the original commune in some cases are other communes, forming 'agglomerations'—notably Brussels, Antwerp, Liège and Ghent. Charleroi, mining centre and seat of metallurgical industry, has spread until its own small commune is the centre of an industrial population of over a quarter of a million. In the following list, the five largest towns are agglomerations; the others, single communes.

PRINCIPAL TOWNS, CENSUS 1947

Brussels.	920,000	Ostend	50,000
Antwerp	477,000	St. Nicholas	44,000
Charleroi	254,000	Seraing	42,000
Liège	247,000	Verviers	41,000
Ghent	217,000	Courtrai	40,000
Malines		Louvain	37,000
(Mechlin)	60,000	Tournai	33,000
Bruges	53,000	Namur	31,000

GRAND-DUCHY OF LUXEMBOURG

This is a small independent State, about 1,000 square miles in extent, wedged in between Belgium, France, and the Rhineland-Palatinate. It consists mainly of high ground deeply furrowed by narrow valleys. Small as it is, it has a high degree of economic importance, from the fact that it has in the south large and workable deposits of iron ore, immediately adjoining similar deposits in France. In 1951 the production of iron ore was over 5½m. tons, of pig iron 3m. tons, and of steel 3m. tons. Over 20,000 of the 300,000 inhabitants are employed in the mining and metallurgical industries. Many more—between a fourth and a fifth of the total—are engaged in agriculture. The principal crops are oats and potatoes, and the most numerous livestock are cattle and pigs.

The present boundaries and political independence of the ancient dukedom date from 1839.

After the First World War a referendum showed a large majority in favour of economic union with France, but the magnates of the French iron and steel industry, dreading the competition of the cheaper labour of Luxembourg, protested against this proposal so strongly that it was abandoned in favour of the alternative: economic union with Belgium. This was negotiated for a period of 50 years, dating from May 1, 1922, when the customs barrier between the two countries was withdrawn. Full economic union followed in 1935. The Second World War brought about a further development, Luxembourg becoming, as from January 1, 1948, a member of the Benelux (Belgium-Netherlands-Luxembourg) Customs Union, designed to promote, by stages, the complete economic unity of the three countries. It has also joined the European Coal and Steel Community (Schuman Plan).

Luxembourg currency has parity with that of Belgium.

The city of Luxembourg (60,000) is the capital, and Esch-sur-Alzette (26,000)—in the iron and steel district—is the only other town of size.

THE NETHERLANDS (HOLLAND)

The kingdom of the Netherlands, lying to the north of Belgium, is an industrial, agricultural, and commercial country. A little larger than Belgium, it is no less densely populated; with a land area of under 13,000 square miles, it has ten million inhabitants. Unlike Belgium, it has no highland region, and until the present century its mineral production was of little account. But the output of the Limburg coal-field—an extension of the Campine coal-field of north-east Belgium—has become important, and still more recently there has been a big production of mineral oil and salt. Particulars of these developments will be given in connection with the growth of manufacturing industry.

In the eastern provinces of Drenthe, Overijssel, and Gelderland, a large part of the surface is sandy heathland, which considerably reduces the area available for crops and pasture. The whole extent of land capable of being so utilised is little more than 70 per cent. of the entire area; but, on the other hand, a large part of the agricultural region is of very exceptional fertility. This is especially the case with those parts, chiefly in the provinces of Zeeland and Holland proper, which lie below the level of the sea and have been regained from the sea by centuries of labour. From the nature of the case these tracts can have no natural drainage, and there are other extensive areas which, though above sea-level, yet lie so low that they cannot be drained by ordinary means. Hence *polders*—that is, enclosures surrounded by dykes or embankments and provided with pumping machinery—form the characteristic scenery of the most populous parts of the country. Only some of the higher polders have semi-natural drainage into canals.

The soil of such areas is naturally moist and is of a quality which yields rich pasture grasses. Cattle (both beef and dairy cattle) are especially numerous (2½m.)—more than the total of horses, sheep, and pigs combined (2½m.). The numbers of all kinds of livestock were depleted during the German occupation in the Second World War, but by 1950 the numbers had been restored, and not only was the production of butter, cheese, condensed and dried milk (434,000 tons) 9 per cent. above the pre-war average, but the exports of these products, which before the war had been nearly

three-fourths of the total production, were the same fraction of the post-war total. There was also a remarkable revival in the exports of potatoes and other vegetables, flower seeds and bulbs, which flourish in the light soils around Haarlem. In the absence of further setbacks, the future should see the full restoration—and even an increase—of the pre-war commercial development, in which large imports of fertilisers and fodder helped to provide such bountiful returns that, as well as the high proportion of animal products already noted as available for export, the export trade included nine-tenths of the supply of bulbs, &c., and half the yield of vegetables, the trade in potatoes being particularly notable. On the other hand, the production of cereals is inadequate for home needs; enough or nearly enough rye and oats is grown, but large quantities of wheat and barley are imported. Sugar-beet is a flourishing crop, yielding per acre much above the general European return, and since the war production has not only caught up with the pre-war average, but in 1950 nearly doubled it, with a crop of close on 3m. tons.

An outstanding development of the present century has been the reclamation of the Zuiderzee. After being repeatedly proposed, the scheme was finally adopted by the government at the close of the First World War. In 1927–32 a dam was built between North Holland and Friesland, shutting off the Zuiderzee from the North Sea and turning it into a fresh-water lake—the present IJsselmeer (*meer*=lake). This mammoth dam, the *Afsbeiddijk*, is 20 miles long and 100 yards wide, with a road at the top 100 feet wide, and it rises 21 feet above sea-level, or about 10 feet above high-water mark in stormy weather. Twenty-five sluices provide an outlet for the surplus waters of the lake, which is kept at about sea-level, and large locks enable ships to pass between the lake and the sea.

The full scheme contemplates the drainage of four polders, lying below sea-level and protected by dykes, with a total area of over half a million acres. The first, Wieringermeer, comprising nearly 50,000 acres attached to North Holland, was completed and settled before the Second World War. It was flooded by the Germans in 1945, but has again been reclaimed. The other three, namely the north-east polder of close on 120,000 acres (completed during the German occupation), and the south-east and south-west polders together covering some 375,000 acres, will form a twelfth province of the Netherlands, with an area of nearly half a million acres (over 750 square miles). What is left of the old Zuiderzee, the IJssel Lake, has an area of nearly 300,000 acres (over 460 square miles).

Manufacturing industry plays a great and growing part in the economic development of the Netherlands. It was hampered for some time after the Industrial Revolution by the dearth of minerals, but this handicap has been reduced by the opening up of the Lim-

burg coal-field. The seams are thin, steeply inclined, and situated at great depths, but intensive mechanisation increased the output from 1.5m. tons in 1909 to 13.4m. tons in 1938, and though there was a drop during the German occupation to 5.1m. tons in 1945, production increased again after the war and was over 12m. tons in 1950. A war discovery was a strike of mineral oil in 1943 and in 1950 the Schoonebeek field in north-east Holland (province of Drenthe) produced nearly 700,000 tons of crude petroleum: enough to provide one-fourth of the home consumption. The present century has also seen the exploitation of big salt deposits at Boekelo in the province of Overijssel, south of Drenthe, with benefit to both industry and commerce. A considerable proportion of the post-war production, which amounted to 400,000 tons in 1950, is exported; some of the rest is refined for table use, and some converted by electrolysis into caustic soda for the rayon and soap industries, while the chlorine gas liberated in the process is used in the manufacture of plastics and insecticides.

These mineral developments have given a big impetus to manufacturing industry in general, which has become the leading occupation in the Netherlands, employing nearly 50 per cent. of the occupied population. Cotton, linen, and woollen industries have long been pursued. Certain of the cotton and linen manufacturing towns in the country—Enschede, Almelo, Hengelo, &c.—are situated in the province of Overijssel, where the cotton industry was established in a thinly peopled district before the close of the eighteenth century; in more recent times the industry has profited by the large market of the Netherlands East Indies (now the Republic of Indonesia, within the framework of the Netherlands Union). Tilburg is the seat of the Dutch woollen industry, Eindhoven of the specialised linen industry (famed for artistic damasks). The latter town is the seat of the great radio and electric lamp factories of Philips, whose ramifications include large works at Hilversum. Utrecht is famed for its engineering and chemical works. The rayon industry has been established at Ede, Arnhem, and Breda. Delft still retains the manufactures of earthenware for which it has long been famous. Iron and steel industries have come to the fore. In 1924 a large up-to-date blast-furnace plant was started at IJmuiden, steel mills were added in 1939 and a big export trade has since developed. Near Utrecht are other steel works operating electric furnaces. The supply of electricity throughout the country in 1950 amounted to 5.5m. kwh. The Netherlands is one of the half-dozen original members of the European Coal and Steel Community—outcome of the Schuman Plan (p. 385).

Shipbuilding is carried on at the mouths of the Rhine and Maas (Meuse), and in 1951 Holland ranked sixth among the countries of the world in this industry. It is noted for its output not only of

merchant vessels but of such special craft as mammoth dredgers and floating cranes, and great deep-sea tugs which tow these special craft across the oceans; while its experimental laboratories and tanks for testing new ideas are world famous.

From the very beginning of its separate existence, Holland has stood in the front rank of maritime nations. Among the facilities for foreign commerce, its internal waterways, natural and artificial, have greater importance than those of any other European country. The length of river and canal navigation (4,335 miles) is more than twice as great as the length of railways (2,000 miles). The Rhine, the Maas (Meuse), and the Scheldt have always given access to important parts of the European interior, and the Rhine in particular, in conjunction with the Rhine valley, has been used as a highway into the continent from prehistoric times. The same geographical conditions have in large measure affected the commercial development of both the Netherlands and Belgium, and under the stress of two World Wars the two kingdoms and the Grand Duchy of Luxembourg have undertaken to work out an economic union, commonly known as Benelux (see under Belgium, p. 394, and Luxembourg, p. 397).

The Netherlands seaports have not as great natural advantages as their Belgian rival Antwerp, but no pains have been spared to enable the two chief ports, Rotterdam and Amsterdam, to meet the requirements of modern commerce. Rotterdam, one of the largest ports in the world, is about 20 miles from the coast. It stands on the Nieuwe Maas (Meuse) where it is joined by the IJssel and Lek, and has to contend with the quantities of silt brought by these streams. Except for its position as one of the gateways to north-western Europe, its development is due less to natural advantages than to engineering skill. The river entrance from the sea is too shallow for large vessels, and a canal was cut to the Maas from Hellevoetsluis, on one of the mouths of the Rhine, across the island of Voorne. Later (1866-72) this was superseded by the 'New Waterway,' a canalised channel just north of the Nieuwe Maas, extending to the Hook of Holland. Constant dredging and other works have since improved the original waterway till now the navigation channel is 330 feet wide and 36 feet deep at low water (38 feet at high water). The harbour has a general depth of 33 feet, and along some of the quays 40 feet. Its basins extend to nearly two square miles, and there are over 10 miles of quays for ocean-going vessels.

Rotterdam is especially well equipped with facilities for loading and unloading cargoes, and in 1938 it headed European ports with sea-borne traffic totalling 42m. tons of goods. During the Second World War it suffered heavy loss both of trade and equipment, but equipment has since been largely renewed and trade is

being built up again. It is the natural port of the Rhine and the Rhine valley, and has greatly benefited by the improvements in the navigation of the Rhine above the Dutch frontier, which make it pre-eminently the port of the Rhine basin for bulky cargoes such as grain and oils. For grain it has not only nine elevators on the quays but no fewer than 26 floating elevators; while the oil storage tanks can take a million tons of mineral oils and a quarter of a million tons of edible oils.

The development of subsidiary ports along the New Waterway should be noted. Vlaardingen, on the north bank, opposite the Petroleum Harbour, has grown from an insignificant fishing village to what is credited with being the third largest port in the Netherlands; it claims to have the largest unloading cranes and bridges in the world. The ocean terminus of the New Waterway, the Hook of Holland (*Hoek van Holland*), has been since 1892 an important nodal point of continental passenger traffic with Great Britain, *via* Harwich.

Amsterdam, which ranks next to Rotterdam among the ports of the Netherlands, and takes precedence over it in size of population, is on the IJ, at the south-west angle of the old Zuiderzee, now the IJssel Lake. Always difficult of access on that side for large ships, its distinction as a port depends on the North Sea Canal which links it up with IJmuiden, on the North Sea coast. This canal, which was completed in 1876, is 15 miles long and has been dredged to a depth of some 42 feet; it is notable for the size of its locks. Previously Amsterdam had been linked by the North Holland Canal with Helder, at the entrance to the Zuiderzee; and later, in 1892, the Merwede Canal (10½ feet deep) was opened, to the Lek and Gorinchem (Gorkum) on the Waal, and so connecting Amsterdam with the Rhine. An improved channel was opened in 1952.

A port of growing importance and already considerable development is Dordrecht, to the south-east of Rotterdam, amid the maze of confusing and confusingly named waterways into which the lower courses of the Rhine and the Maas unite and divide. Flushing (Vlissingen) is important not only as a port of entry for passenger traffic but as a shipbuilding centre. While it was cut off from the mainland by the channels between the islands of Walcheren and South Beveland, and between South Beveland and the mainland province of North Brabant, it was of comparatively small account, but since these channels have been crossed by massive embankments carrying a main line of railway connecting with the northern parts of Central Europe, Flushing has come to rival Ostend for postal and express traffic of high value in proportion to its bulk.

Zaandam, to the north-west of Amsterdam, on the Zaan river, connected with both the North Sea Canal and the North Holland Canal, is the port for a highly industrialised region with large saw mills, oil mills, &c.

Playing a prominent part in coastal shipping are Delfzijl, in the extreme north-east of the Netherlands, facing Emden across the mouth of the Ems; and Harlingen, in the extreme north-west, over against the West Friesian Islands. Though primarily interested in coastal services, both these ports share in overseas shipping.

Overseas Trade. The overseas trade of the Netherlands has been affected not only by the Second World War but by the subsequent grant of independence to the Netherlands East Indies as the Republic of Indonesia (see p. 599) and the continued dislocation of industry and trade within the republic. The Dutch guilder, or florin, has lost little in value in relation to the £; equivalent before the war to nearly 2s. 6d., it is still worth nearly 2s. Special imports in 1951 were valued at Fl. 9,634m. (£903m.), and special exports at Fl. 7,338m. (£700m.). Of the imports, food and drink accounted for 15 per cent. of the total; raw materials or crude products for over a third; and manufactured goods for nearly half. In view of what has been said earlier about production in the Netherlands, it is not surprising that food and drink provided a third of the exports and manufactures nearly half, while crude products amounted to little more than one-sixth. The chief contributors of imports were, in descending order of value, Belgium-Luxembourg, Germany, the United States, the United Kingdom, and Indonesia, which between them provided well over half the total. Exports were consigned mostly (again well over half) to the same five countries, though on this side of the account the United Kingdom headed the list, the order of the others being unchanged.

As will be seen from the appended list of towns with populations of over 100,000, Amsterdam, Rotterdam, and The Hague easily top the list, the first with well over $\frac{3}{4}$ m. and each of the other two with between $\frac{1}{2}$ m. and $\frac{3}{4}$ m. Amsterdam is regarded as the commercial capital of the country, but The Hague (in Dutch *Den Haag* or 's *Gravenhage*) is the seat of the Court and of the Dutch legislature, as well as of the International Court of Justice. Its growth is largely due to its attractions as a residential city.

Eight other towns in 1949 had a population of over 100,000, a number which, in so small a country, is significant both of the density of the population and of the industrial development.

LARGEST TOWNS, JANUARY 1, 1950

Amsterdam	835,834	Groningen	136,556
Rotterdam	675,905	Tilburg	120,491
The Hague	558,849	Nijmegen	110,659
Utrecht	193,190	Enschede	106,882
Haarlem	161,980	Arnhem	103,317
Eindhoven	140,554		

GERMANY

Before the Second World War, Germany had an area of about 182,000 square miles and a population of 69m. After the war, the northern part of East Prussia was taken over by Russia, and the territories east of the Oder and Neisse rivers, including the ports of Stettin (Szczecin) and Swinemünde (Swinoujście), were placed under Polish administration pending a definite settlement by peace treaty. The rest of Germany was divided into four Occupation Zones, administered by the United States, the United Kingdom, France, and the Soviet Union.

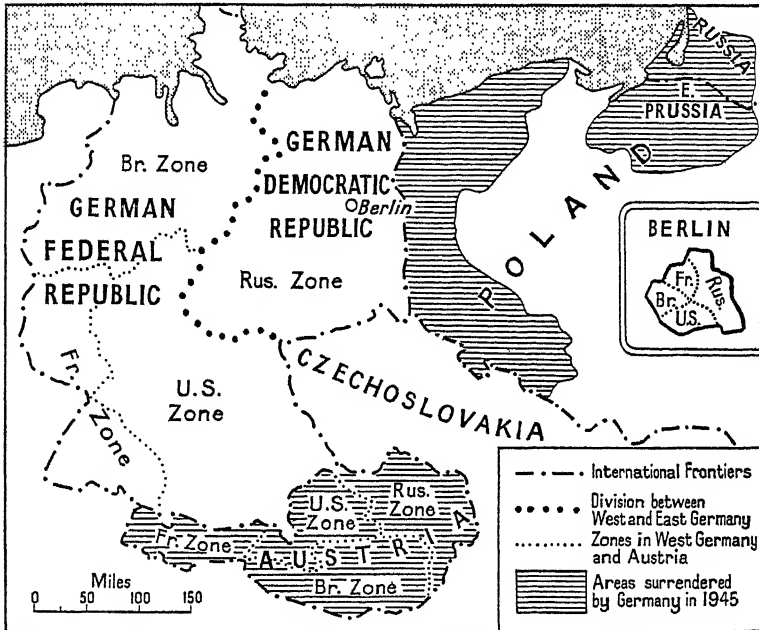
In 1949, the territories of the American, British, and French Zones, comprising nearly 95,000 square miles with a population (1950 census) of 47½m.—little different, that is, from Great Britain in either area or population—were united to form the Federal Republic of Germany (commonly known as Western Germany), with Bonn as the seat of government. In the same year the German Democratic Republic (Eastern Germany) was constituted in the Soviet Zone (about 41,000 square miles; population at 1946 census, 17·3m.).

Berlin constitutes a separate territory of over 300 square miles (population 3m.), forming an enclave in the Soviet Zone. It is divided into four Sectors, which at present fall into two groups—Eastern Berlin (the Soviet Sector) and Western Berlin (the Sectors of the three Western Powers).

Pending a final settlement of the limits and governance of post-war Germany, these distinctions have been largely ignored in the following pages, which trace the geographical and commercial relations of the foregoing territories as a whole.

Political Development. After the disintegration of the Holy Roman Empire in 1806 Germany emerged from the Napoleonic wars as a curious medley of 39 independent states—35 monarchies and 4 republican free cities. They formed the loose 'German Federation' (*Deutscher Bund*), as constituted by the Vienna Congress of 1815. Trade and economics were at a low ebb, and the countries of the federation were hemmed in from all sides by internal and external customs and excise tariffs, so that a crop failure caused by abnormally bad weather conditions in 1816 brought about a famine

in the following winter. From then onward a gradual lifting of the internal barriers resulted in the economic—and with it the political—unification of Germany. The first step in this direction was the abolition of all internal duties within the kingdom of Prussia, effective from January 1, 1819. As Prussia comprised about one-third of the territory of the German Federation, it formed an economic unit which was bound to affect the economies of the adjacent states. Trade found transportation cheaper on Prussian territory, and began to prefer the Prussian means of communication.



POST-WAR GERMANY IN 1953.

The south German states of Bavaria and Württemberg sought to counterbalance this development by forming a Southern Union (*Süddeutscher Zollverein*) in 1828, while in the same year the Grand-Duchy of Hesse-Darmstadt entered a union with Prussia (*Norddeutscher Zollverein*); these two unions, by mutual agreement, then brought their fiscal systems into harmony.

January 1, 1834, marks the beginning of modern Germany. At this date the two unions merged (*Deutscher Zollverein*), and Saxony and the Thuringian states joined it. Thus the greater part of the German states was economically united and the other states had to join sooner or later if they did not want to incur serious

economic isolation. Of the larger states, Baden joined in 1835, Nassau and the free city of Frankfurt in 1836, Hanover in 1851, and Schleswig-Holstein in 1866, while Austria stood aside. The incompatibility of Prussian and Austrian interests was responsible for the dissolution of the 'German Federation' of 1815 and the formation in 1866, under Prussian auspices, of the smaller 'North German Confederation' without Austria. Out of this confederation grew, after the Franco-Prussian War of 1870-71, the German Empire, a federal monarchy. But the economic borders did not yet coincide with the political. The Free Cities of Hamburg and Bremen did not join the Customs Union until 1888, whereas Luxembourg, while politically independent and neutralised under the Treaty of London of 1866, was part of it until 1922, when it entered an economic union with Belgium. In 1891 two Austrian communities in the Alps, only accessible from Bavaria, were incorporated in the Customs Union. On the other hand, two very small villages on the Swiss border, the free port areas of Hamburg and Bremen, and the island of Heligoland remain outside the Union up to the present day. After the First World War, as an economic compensation for war losses, the Saar territory was made part of the French economic system for 15 years. It was re-united with Germany by plebiscite supervised by the League of Nations in 1935, but again passed under French control after the Second World War.

The economic body was dismembered at the end of the Second World War, as already noted. The partition into four Occupation Zones resulted, for a time, in the stagnation of economic life. The federation of the British, French, and American Zones as a single political unit (Western Germany) relieved the situation to some extent; but Western Germany and Eastern Germany (Russian Zone) are practically separated by the occupation borders, across which the exchange of goods, payments, and persons is restricted to a minimum.

Surface Features. Geographically, Germany consists of three distinct parts: the northern lowlands, the central mountains, and the southern plateaus and basins. The north German lowlands, bordering on the North and Baltic Seas, comprise vast plains little above sea-level near the North Sea, and low hills farther inland or near the Baltic coast, where the country was covered by the great ice drift. Each stage in the retreat of the ice was marked by the formation of a great east-west depression, cut out by the masses of water melting from the ice sheet and flowing parallel to its edge. These primeval valleys ('*Urstromtäler*'), only partly used by present-day rivers, form the basis of the well developed system of inland waterways in northern Germany.

The soils of northern Germany vary greatly in quality and economic value. The most fertile are the soils of the reclaimed

lowlands along the North Sea coast, consisting of clay and loam, and the loess soils which cover a continuous strip of land, widening from west to east, at the foot of the central German mountains, from the region of the lower Rhine in the west to Breslau and Oppeln in Silesia (now Poland) in the east. The primeval valleys consist of sandy soil which in places is blown together into sand dunes and mostly covered by vast pine forests. In the north-west, large peat bogs form a bleak and desolate landscape, but even here land reclamation has gone a long way towards improving the countryside.

The central German mountains rise rather abruptly, and form a region distinct from both the lowlands in the north and the plateaus and basins in the south. They stretch from the Belgian and Luxembourg borders in the west to the Czech frontier in the east, where they give way to the mountains flanking the Bohemian basin. The rock formations vary from granites, basalts, and metamorphic schists to limestones, sandstones, and coal beds. The northern front of the mountains does not form a straight line, but is broken by three deep indentations or bays. Thus the Rhenish Bay penetrates deeply into the Rhenish Massif, the Westphalian Bay between the Rhenish Massif and the Weser Mountains, and the Thuringian Bay between the Harz Mountains and the Thuringian Forest. On the other hand, the Teutoburg Forest and the Harz jut far out into the northern lowlands. Within this mountain belt an ever-changing variety of plateaus and rounded hills, of basins, rift valleys, and river gorges is to be found; the heights are covered with forests (from which many places derive their names) or heaths, and the basins provide the cultivable land.

The southern front of the mountain belt is in places clearly marked by fault lines (Hunsrück, Taunus, Thuringian Forest), in places obliterated by transverse faulting or cut by rivers. Here are the great gaps through which northern and southern Germany are connected by rail, road, river, and canal.

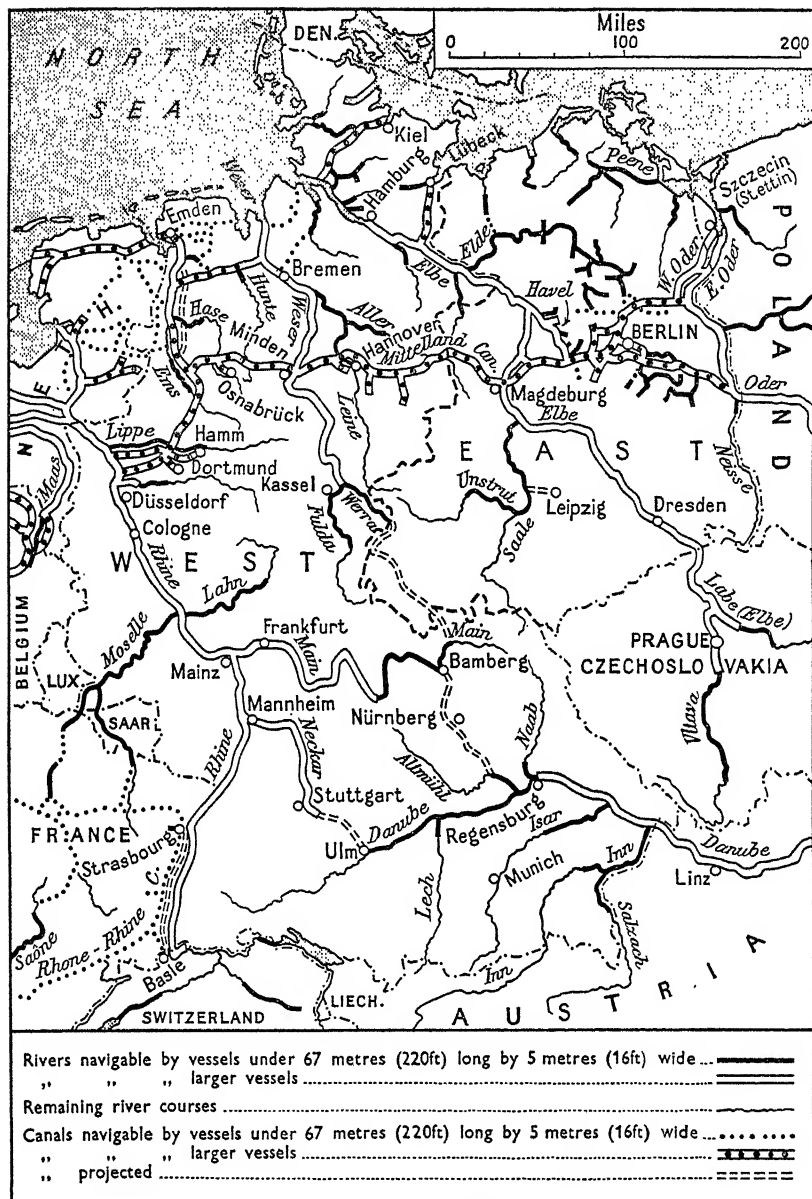
Southern Germany is composed of numerous plateaus and basins suspended between the high mountain ridges of the Black Forest (4,500 feet) in the south-west and the Bohemian Forest (4,400 feet) in the east. The great rift valley of the Upper Rhine cuts southern Germany into two unequal parts, so that the country rises in steps from a point near Mainz to the south-west and south-east respectively. These steps are marked by long escarpments, such as the Haardt Mountains and the Saar escarpment to the west of the Rhine, Odenwald, Steigerwald, and the Alb plateaus to the east. South of the Danube, between the Lake of Constance and the River Inn, another landscape begins—the Alpine Foreland. High plateaus, mostly above 1,500 feet, are covered by glacial deposits, *i.e.*, gravel beds, loams, and loess. The southern parts of the plateaus

are covered by glacial drift, which forms a blanket over high hills, encircles some large and numerous small lakes, and at last melts into the foothills of the Alps, of which only a small strip falls within the German frontier.

Inland Waterways. With one exception, all German rivers flow to the north-west: the Danube, rising from the Black Forest, flows eastward. The Rhine is the only Alpine river to reach the North Sea; its valley therefore is the only natural waterway through the central mountains and is of supreme importance to the economic life of Germany. Besides the Rhine, three other large rivers, Ems, Weser, and Elbe, flow into the North Sea, and a fourth, the Oder (now mostly assigned to Poland), flows into the Baltic. They form big estuaries, at the head of each of which, but still within the tidal range, has grown up a large seaport—respectively Emden, Bremen, Hamburg, and Stettin, the last now included in Poland as Szczecin.

By far the most important river, judged both by length and volume of water, is the Rhine. The navigable stretch of the Rhine between the Swiss frontier, where it enters Germany, and the Dutch frontier, where it leaves, extends to 440 miles. Its tributary system drains 23 per cent. of the German territory. By its long and winding tributaries—the Mosel (with the Saar), the Main, the Neckar—a vast hinterland is made accessible by water or is being made so. Next in importance comes the Elbe with a tributary system draining 21 per cent. of Germany and a navigable stretch of 480 miles between Hamburg and the Czech frontier. The Weser is navigable for 290 miles, without its principal tributaries, the Fulda and the Werra; the Oder for 500 miles; the Danube between Regensburg and Passau for 150 miles.

These natural waterways are connected by a well-planned system of canals, most of them in the north German lowlands, where nature favoured the construction of canals in the aforementioned primeval valleys. Thus the Upper Rhine region is connected by water with the far distant industrial district of Upper Silesia. Berlin, in the centre of this vast net, has physically at least equal access to the coal of Silesia and of the Ruhr and Saar, to Baltic as well as to North Sea ports. Only the Danube system lacks connection by a practicable canal with the Rhine system, the Ludwig Canal being obsolete. The projected Rhine-Main-Danube Canal, first planned in 1921, has been under discussion from time to time, and 220 miles of the 425-mile stretch between the Rhine and the Danube have been constructed. Further building, canalisation, and straightening are going on along the route and the canal is scheduled for completion by 1960, at a total cost of £170m. Associated with the locks along this new waterway will be hydro-electric power stations; 16 of the projected 45 were already in operation in 1951. Designed to replace the old Ludwig Canal, this new route will not



GERMANY: INLAND WATERWAYS.

Based on information supplied by courtesy of the Ministry of Transport,
Western Germany.

only provide a cheap waterway between the agricultural regions of Bavaria and the manufacturing districts on the Rhine, but will connect Germany with the Danubian countries and the Black Sea.

The total length of inland waterways in Germany prior to the Second World War was about 7,000 miles, of which those of economic importance accounted for 4,830 miles. On these waterways 5,375 self-propelled craft and 12,500 barges carried a total freight of over 150m. metric tons a year (foreign craft excluded). The three inland ports with the biggest traffic were Duisburg-Ruhrort, at the junction of the Rhine and the Ruhr, the most important inland port in Europe, with a total of 17m. tons in 1936; Hamburg (river port only), with 9m. tons; and Berlin, with 8.5m. tons. In 1949 the Federal Republic of Western Germany had some 3,000 miles of navigable rivers and canals, with an inland waterways fleet of 9,000 vessels of nearly 3m. tons, carrying 57m. tons of freight.

The Rhine navigation up to Mannheim far excels that of all other German waterways. No other European river has so large a population gathered in large towns on its banks, a fact peculiarly favourable to water traffic. From the Dutch frontier as far as Strasbourg the Rhine has been so improved that barges of 2,000 tons can ascend to that port. Extensive harbour accommodation has been provided at Duisburg-Ruhrort, the port of the Ruhr basin; at Düsseldorf, the port of the southern part of the great manufacturing district of western Germany; at Cologne, Mannheim, Ludwigshafen, and other ports on the Rhine. Above Strasbourg, 1,000-ton barges can ascend as far as Basel during more than half the year. Much of the Rhine traffic is directed to and from the German North Sea ports through canals, but even so the inward and outward traffic crossing the Dutch border near Emmerich amounted to nearly 46m. tons in 1936. This figure included a great deal of sea-borne traffic, as sea-going vessels may reach Duisburg *via* Rotterdam.

The German waterways have been greatly improved during the last two decades. Previously the navigable system fell into two separate parts, which have since been united by the completion of the Mittelland (Midland) Canal, with its branches to the industrial districts of Osnabrück, Hildesheim, Hanover, and Watenstedt-Salzgitter. A great many waterways have been adapted to take barges of 1,000-tons capacity. Apart from the big rivers, waterways which have been brought up to this standard include the Berlin-Stettin Canal; the Saale as far as Halle, whence an extension to Leipzig is planned; the Main, on which 1,000-ton barges now ascend beyond Würzburg; and the Neckar up to Heilbronn, while a 1,000-ton canal as far as Stuttgart is under construction.

The Kiel Canal (German, *Nord-Ostsee Kanal*), completed in 1895, serves sea-borne traffic exclusively. It crosses Schleswig-

Holstein from the North Sea (mouth of the Elbe) to the Baltic (Kiel Bay), and is 53 miles long, with a surface width of 338 feet and a depth of 37 feet. It has only two locks, one at either end, and can take vessels up to 1,033 feet long and 130 feet wide, with a draught of 31 feet; but it is chiefly used by small vessels passing between the North Sea and the Baltic, as it enables them to avoid the lengthy passage round the north of Denmark. The saving in distance from the mouth of the Elbe is 237 miles, and there is a greater or less saving from or to all North Sea ports south of the Tyne. Before the Second World War, the net tonnage of the shipping passing through the canal had increased, after various ups and downs, to 22.6m. (1938). After the war, the tonnage was 9.4m. in 1947, increasing to 17.8m. in 1950. The small average size of the vessels using the canal is shown by the numbers compared with the tonnage. In 1938 the number of vessels was 53,530 and the average net tonnage 420, while in 1950 the number was over 47,000 and the average net tonnage 377.

Railways. Traffic facilities on land are numerous and well-developed. Before the Second World War, Germany had 43,000 miles of railway, or rather more than Great Britain in proportion to area, and considerably more in proportion to population. After the war, in 1951, the railway mileage of the Federal Republic (Western Germany) was 19,100, which agrees fairly closely, both actually and relatively, with the British mileage. The railway net of the Ruhr or Saar coal districts and the Frankfurt district is comparable with the busiest parts of the Black Country or of Lancashire. The most impressive traffic scene is along the Middle Rhine gorge between Bonn and Bingen, where a double-track railway line and a high road are packed between the river bank and the steep cliffs on either side of the gorge. In the rift valley section of the Rhine—between Frankfurt and Karlsruhe—three or even four main lines run parallel to the river and are crossed by numerous lines which converge on the bridges over the Rhine.

On the whole, surface difficulties are not excessive. The northern plains and lowlands offer hardly any difficulties, apart from the big rivers with areas liable to temporary flooding. The connections between north and south are facilitated by the Rhine valley, the Hessian Depressions (a succession of basins and river valleys amidst mountainous regions between Frankfurt and Kassel), and the Leine valley farther north. In south Germany, the Upper Rhine presents an ideal traffic lane right through from Frankfurt to Basel in Switzerland; and the basins and high plateaus of Württemberg and Bavaria provide good communications in every direction. Serious obstacles to railway traffic are offered only by the Black Forest, which has only two lines crossing its ridge at high altitudes, and by the mountainous wooded country along the Czech frontier. On the south-

west borders of Bohemia, only four lines cross the Bohemian Forest (*Böhmer Wald*) in a distance of 125 miles: one at Cheb (*Eger*) in the north; the second at Fürth, in the centre; the third skirting the highest peak, Mount Arber (4,400 feet); and the fourth starting from Passau, on the Austrian frontier. Of these the last two lines are merely of local importance.

The Thuringian Forest, which extends the Bohemian Forest north-westwards into Germany, has long been avoided by railways. The first lines between Bavaria and Thuringia-Saxony rounded either its north-western tip near Eisenach, or, at the other extremity, the east side of the Vogtland plateau. Since then, three more main lines have been constructed across this mountain ridge. One of them crosses it through a tunnel (2 miles long) near Oberhof, the other two keep above ground by steep ascents on both flanks and several long viaducts. Another serious obstacle is the Erzgebirge, along the north-west borders of Bohemia; for a distance of more than 40 miles no railway crosses this tract.

Many international trains cross Germany on their way from western to eastern Europe or from Scandinavia to Italy. The routes from France, Belgium, or the Netherlands to Poland and the Soviet Union run *via* Cologne-Hanover-Berlin-Warsaw or Riga-Leningrad, or Leipzig-Breslau-Cracow. The route from north-western Europe to the Balkans passes through southern Germany *via* Stuttgart-Munich. Traffic with Italy is served by three routes. One, following the Rhine up to Basel, and on through the Gotthard or Simplon Tunnels, was in sharp competition with the French Channel ports-Paris-Simplon or Mont Cenis routes. Another connects Scandinavia and the most populous parts of Germany with Italy across Tyrol and the Brenner Pass. The third, leading through Bohemia or the Moravian Gate and connecting eastern Germany with Trieste *via* Vienna and the Semmering Pass, has been greatly affected by traffic restrictions and political tensions since 1918.

Most of the railway lines are of standard gauge and are state-owned.

Roads. In 1937 Germany had 134,000 miles of roads, more than half of them over 15 feet wide. A new development in the pre-war years was the building of great highways reserved for motor traffic (*Autobahnen*). Work on these roads was begun in 1933; 985 miles had been completed in 1937, and when work on them was stopped by the outbreak of war in 1939 their length was 3,150 miles. They form a triangle between Berlin, Munich, and Cologne with extensions from Berlin to Stettin (Poland), Frankfurt on Oder and Breslau (Poland), and from Munich to Salzburg (Austria). Detached lines connect Königsberg (U.S.S.R.) with Elbing (Poland) and Lübeck with Hamburg and Bremen. A central line between Dresden and the Ruhr district has been only partly completed.

At the beginning of 1951, Western Germany had 79,300 miles of roads, including 1,315 miles of *Autobahnen*. A characteristic feature of German motor traffic is the large proportion of motor cycles; they comprise nearly half the total number of motor vehicles. In 1937, motor vehicles of all kinds numbered 2,850,000, or one for every 24 of the population. In 1951, Western Germany had 2,155,355, or one for every 22 of the population, and they included 987,583 motor cycles.

Climate and agriculture. Generally, Germany suffers from too hard a climate to rank as one of the world's prime agricultural countries, despite the general suitability of her soils. North Germany reaches up to latitude 55° N. (the latitude of Newcastle), and though south Germany extends to below the 48th parallel (on a level with the Loire valley), this advantage is more than balanced by the high average elevation in the south. Nor, wherever favourable conditions may be found, does superiority of climate always coincide with superiority of soil. The higher latitude of the north results in lower mean temperatures during the whole of the year; the easterly situation of Silesia in more intensive climatic conditions. This means an increase from west to east in the duration of the period of frost. Only in the rift valley section of the Rhine (the long and narrow plains between Mainz and Basel) and the valleys of the Mosel, Main, and Neckar, are there seven months in the year with a mean daily temperature above 50° F.; and only in the Upper Rhine plain is there one month with a mean daily temperature of 68° F. or more. In East Prussia (now assigned to Russia and Poland) a mean daily temperature below freezing point may be experienced for three months on end.

It follows that success in agricultural production is due less to natural conditions than to intensive cultivation. Much has been done in this way to overcome the climatic drawbacks, and a wide variety of crops is grown. Of the total surface in 1936, 61 per cent. was cultivated land (two-thirds of it arable and one-third grass land), 27·5 per cent. was forest, and 11 per cent. consisted of public domains, water, or uncultivable land. The development of agriculture in Germany has always been carefully fostered. It enjoyed a high degree of tariff protection against low cost extensive production from abroad. Scientific research, beginning more than a century ago, and university training (*Landwirtschaftliche Hochschulen*) in all parts of the country spread progressive thinking and modern methods of farming. Thus the idea and practice of fertilising were developed, and German agriculture enabled to meet about 80 per cent. of the demands of the ever-growing population. Great pains were taken to close even this 'food gap,' in order to free the foreign trade budget from a heavy burden, but without notable success. Between 1932 and 1937 the use of fertilisers rose considerably: of

nitrates by 162 per cent., of lime by 114.5 per cent., of phosphates by 153 per cent., of potash salts by 152 per cent. The average yields of the several crops were among the highest in Europe, absolutely as well as in relation to the acreage.

The chief cereal crop of Germany is rye, the typical grain in central, northern, and eastern Europe. Less exacting than some crops as to quality of soil and mean temperatures, and more resistant to frost, it is very suitable for lighter soils and higher altitudes. In Germany it yielded on an average, in 1928-36, 25 bushels per acre over an area of 11.25m. acres, the total crop averaging 7.5m. tons a year. The acreage was less than at the end of last century, but the acreage under wheat was more than maintained, extending to over 5m. acres, and producing 4.8m. tons. This development was facilitated by the introduction of breeds adapted to the climate as well as by improved cultivation. In the first three decades of the present century the average yield of wheat increased from 30 to 32 bushels per acre, which is nearly twice the average for the United States or Canada.

Among root crops the most widely cultivated is potatoes, which in 1935 covered about ten times as great an area in Germany as in Great Britain. From 7m. acres yielding 230 bushels to the acre, production amounted to about 43m. tons. Potatoes play an important part both as human and animal (hog fattening) food, and in industry. They are grown everywhere, but prefer the lighter types of soil. The other important root crop, sugar-beet, gives large yields on heavy rich soils and has been grown on much of the loess-belt in central or northern Germany, from the Lower Rhine to Silesia. In south Germany, sugar-beet is extensively grown in the Upper Rhine valley and in the Main and Neckar regions. Between 1928 and 1936 it covered nearly a million acres, yielding 436 bushels to the acre, or 12m. tons a year.

Vine cultivation reaches its most northerly boundary in the world in Germany; the area covered by vineyards (180,000 acres) in the sheltered valleys of the Mosel, Saar, Rhine, Main, Neckar, and on the shores of the Lake of Constance, is only about one-twentieth of the area so occupied in France. But the white 'hocks' of Germany stand in a class of their own, almost without rivals. In the same regions orchards abound (250,000 acres), and limited quantities of tobacco (32,885 tons from 32,500 acres in 1936) and hops (10,100 tons from 25,000 acres) are also grown. The area under hops decreased to less than one-half between 1910 and 1936, but the average yield to the acre was more than doubled, so that the production remained constant.

In the division of the country after the Second World War, Western Germany was left with about one-third of the total acreage of rye in the pre-war Reich, and about 40 per cent. (in each case)

of the total areas under wheat, potatoes, and sugar-beet. Productively the proportion was rather higher. In 1950 the acreages and yields of the chief crops in Western Germany were:

Crop.	Area Million acres.	Production Million tons.	Crop.	Area Million acres.	Production Million tons.
Rye . .	3.5	3.1	Barley . .	1.5	1.45
Wheat . .	2.5	2.6	Potatoes . .	2.8	27.5
Oats . .	3.3	2.9	Sugar Beet . .	0.5	6.9

The figures in the following table for Eastern Germany (Russian Zone) are not strictly comparable with those in the preceding table, the data being for the year 1949:

Crop.	Area Million acres.	Production Million tons.	Crop.	Area Million acres.	Production Million tons.
Rye . .	3.2	2.0	Barley . .	0.6	0.45
Wheat . .	1.2	0.9	Potatoes . .	2.0	8.4
Oats ¹ . .	1.6	1.1	Sugar Beet . .	0.5	3.5

¹ Including mixed grain (about one-fifth of the total).

Eastern Germany, being less than half the size of Western Germany, might be expected to have smaller crop areas, and in general the foregoing tables show that such is the case; but the area under sugar-beet in Eastern Germany is as great as (usually greater than) the area in the Federal Republic, and the area under rye is not far behind. It will be noted that in every case the production in the Eastern Republic is much smaller in relation to the acreage than in Western Germany.

The half-dozen crops of which particulars are given cover nearly three-fourths of the cropped area in Western Germany and over four-fifths of the corresponding area in Eastern Germany. In both republics, farmlands of all kinds, including pastures and orchards, constitute about three-fifths of the whole country; forests cover over a quarter, and the balance is made up of built-on areas, waste lands, &c. Pastures form a much bigger proportion of the farmlands in Western than in Eastern Germany, and the livestock industry is on a much bigger scale. At the end of 1948, the Western Republic had 10.6m. cattle (against 2.9m. in Eastern Germany), 2.5m. sheep (against 0.7m.), 1.6m. horses (against 0.7m.), and 6.8m. pigs (against 2.6m.). In each case the numbers were less than pre-war in Eastern Germany, but Western Germany had more than caught up with the pre-war figures for sheep and horses, and

was catching up with her cattle, half of which were milch cows. Both republics were badly down on pigs, which were only about half the pre-war numbers. Livestock figures for a single year must always be interpreted with caution. By the end of 1950, pigs in Western Germany had increased to 11·9m.—almost as many as before the war; but sheep were down to 1·6m.—only three-fourths of the pre-war number.

In both republics small holdings predominate. In Eastern Germany all estates of over 250 acres have been expropriated without compensation and distributed among peasant workers and refugees. The new owners were not provided with adequate funds for livestock, machinery, and housing, and the standard of farming has fallen: a circumstance which helps to explain the low crop returns and the slow recovery in the numbers of livestock. In Western Germany there is still a small percentage of large estates, principally in the north and north-east districts, but out of a total of upwards of 2m. holdings in 1950, more than half did not exceed a dozen acres, and another third were under fifty acres.

Mineral deposits. Germany's greatest mineral asset is bituminous coal. Coal beds are found along the northern fringe of the central mountains, from Aachen to Upper Silesia, and in basins within them, namely, the Saar, Zwickau-Chemnitz (Saxony), and Waldenburg (Silesia) basins. Many of these are being worked. Their productiveness varies greatly. Reserves in the Ruhr basin are estimated at 55,000m. metric tons, or nearly 70 per cent. of the total; second in importance is the Saar basin, with 9,205m. tons; third, Germany's pre-war part of the Upper Silesian coal-field (now Polish), with 4,000m. tons. Until 1945 the Upper Silesian coal-field was divided between Germany, Poland, and Czechoslovakia; as a whole it is probably the biggest continuous coal-field in Europe. Some coal-fields in Germany are not yet exploited, and the total reserves in the areas named are estimated at 80,500m. tons.

The production of coal in Germany (including Austria) in 1938 was 184m. tons, of which 135m. tons was raised in the territory which now constitutes Western Germany. In 1947 the output of both Eastern and Western Germany (the four zones of occupation) was 83m. tons, of which the great bulk (70m. tons) was produced in the three Western Zones. By 1950 the output in Western Germany had increased to 109m. tons, or 80 per cent. of the pre-war production in that area.

Lignite deposits are on almost as large a scale. Here East Germany is dominant, *i.e.* Thuringia, Saxony, and southern Brandenburg, with five large fields, but the biggest continuous lignite-field is west of the Lower Rhine near Cologne. Lignite serves as fuel for domestic use and in factories and thermo-electric power stations; also as a basis for coal hydration. While bituminous coal

and anthracite are mined from pits, lignite is worked in open quarries and is cheaper than coal. Total reserves are estimated at 56,750m. metric tons, and production throughout Germany (including Austria) in 1938 was about 190m. tons. Recovery since the war has been more rapid than in the case of coal. Production in the four zones of post-war Germany reached 159m. tons in 1947, including 58m. tons from the three Western Zones, and in 1950 Western Germany produced 75m. tons, which was more than in 1938.

Germany's petroleum deposits, though small in relation to world production, are deserving of mention. They are divided into two groups. The first, which has been known for some decades, lies on a semi-circle with a 20-mile radius north and east of Hanover, the main field being at Nienhagen. The oil wells are bound tectonically to the salt-dome structures underground. The known reserves have been estimated at about 2m. tons, and there is little prospect of any substantial increase on this figure. Three more fields near Hamburg, Wilhelmshaven, and Heide in Holstein are inconsiderable and after long and fruitless search for other sources of supply it was concluded that petroleum in Germany was confined to salt domes. This was proved to be erroneous in 1940-42, when the comparatively big fields north of Bentheim, in the Emsland near the Dutch frontier, were found. The new supplies were associated with simple anticlines of the cretaceous Teutoburg Forest sandstones, which by faulting had sunk 1,300-2,800ft. below the surface. The known reserves are estimated at about 4m. tons, and further probable reserves at 4m. A second valuable product is the natural gas of Bentheim, with known reserves of 31,500m. cubic feet and further probable reserves of 7,600m. cubic feet. The production of crude oil before the war, in the area now comprised in Western Germany, was a little over half a million tons. This was exceeded in the post-war years, and in 1950 the output was over a million tons.

Germany's deposits of salts are practically inexhaustible. Rock salt is found in all parts of central, south-west, and north Germany, and is only vaguely estimated at about 10 billion tons. Potash salts, for the first time found free in nature, which were formerly dug up and thrown away as waste (*Abraum*) in the course of getting rock salt, are now known to be the more valuable of the two. These 'waste' salts (*Abraumsalze*) have become the basis of the German chemical industry and reserves are estimated at about 20,000m. tons. Rock salt production in 1936 was 2.4m. tons, potash 4.7m. tons. In 1950 the production of potash in Western Germany was nearly 9m. tons.

In contrast with the abundance of this mineral wealth, Germany is poor in metallic ores. Iron ores are found in many parts of north-west and south Germany, but they are of inferior quality.

The whole reserves are estimated at 720m. tons, but of these only half can be exploited under normal economic conditions. The production in 1936 was 7½m. tons of ores with an iron content of 2¼m. tons. More than four-fifths of the ores came from districts now included in Western Germany, and these alone in 1950 yielded 10¾m. tons of iron ores. Imports are necessary, chiefly from Sweden, Spain, and France.

Copper ores are mined in only one formation, in the south-eastern foothills of the Harz Mountains; 1,125,000 tons of ore containing 27,000 tons of copper were produced in 1936. In Upper Silesia (now in Poland) lead and zinc ores are found. Their production in 1936 amounted to 100,000 tons of lead and 200,000 tons of zinc ores, yielding 45,000 tons of lead and 115,600 tons of zinc.

Radium ores (pitchblende) in the Erzgebirge extend from the Czechoslovakian side of the ridge, near Joachimsthal, northwards into Saxony. Here, in the Eastern Zone, in the neighbourhood of Annaberg and Aue, uranium mines employing 40–50,000 men are being worked under Soviet direction.

Industrial Development. On the basis of her mineral resources Germany developed an extensive manufacturing industry. The heavy industries, dependent on mining, have grown up on or near coal-fields and iron-ore deposits. The biggest industrial region is based on the Ruhr coal and the Sieg-Lahn ores, which are located in neighbouring districts. A corresponding combination gave rise to the Upper Silesian industry. Smaller enterprises are found in the Saar territory (dependent on its coal and the Minette ores in Lorraine—see p. 384), and in Saxony. Even the relatively poor ores of the Watenstedt-Salzgitter field, south-west of Brunswick, have formed the basis of heavy industries in the foothills of the Harz Mountains. As no coal is found in this neighbourhood, a branch of the Mittelland Canal was constructed to facilitate the necessary deliveries of coal from the Ruhr.

In 1931, at the beginning of the world economic 'slump' which characterised the early thirties, Germany's production of pig-iron was about 6m. tons. In 1932 it dropped to under 4m. tons from 37 plants. In later pre-war years, production was pushed so vigorously that in 1936 the output of pig-iron reached over 15m. tons from 42 plants, and it has been estimated that at its peak it reached some 22m. tons. The production of steel before the war rose to 18·5m. tons from 73 plants. Figures are lacking for post-war Germany as a whole, but in 1950 Western Germany produced over 9m. tons of pig-iron, nearly 12m. tons of steel ingots and castings, and over 8m. tons of finished rolled products. If these figures be compared with the iron content of the iron ores mined in Germany, as previously quoted, it will be realised how largely Germany is dependent on the importation of foreign ores to maintain her

production of iron and steel. The same is true, on a smaller scale, of her output of copper and zinc.

As already noted, the numerous salt deposits form the basis of Germany's intricate chemical industry. The richest salt mines are located in Saxony, between Magdeburg and Merseburg. Here Stassfurt became the seat of a greater concentration of chemical factories than is probably to be found anywhere else in the world. But mines and factories are also found near Brunswick, in Holstein, Brandenburg, Hesse, and Baden on the Upper Rhine, the last-named field reaching across the river into French Upper Alsace. From the salts, in their natural state, carbonate of potash is extracted and used in soap-making, dyeing, bleaching, glass-making, calico-printing, pigment-making, pottery, &c. The mineral salt kainite, or sulphate of potassium, which contains also a certain proportion of magnesium salts, is used as a fertiliser and for other purposes. Other layers in the salt-beds yield nitrate of potassium, for the making of explosives, glass-making, pickling, &c.; various compounds used in photography, such as cyanide, bromide, and iodide of potassium; and a great variety of other substances. With the Alsace field, Germany held a monopoly of potash salts in world trade till 1918.

Apart from local causes favouring certain chemical industries, the production of coal-tar dyes made Germany pre-eminent in the sphere of industrial chemistry. The most important step in the history of this industry was the artificial production of alizarin from anthracene by two German chemists in 1868, and from that date the technical production of dyestuffs was almost exclusively in German hands till 1914 (see p. 308). The leading works manufacture not only their own semi-raw materials, but also such subsidiary products as are the speciality of the heavy chemical industry—sulphuric acid, nitric acid, soda, caustic soda, &c. They require large quantities of raw materials, and are all situated on great waterways—at Ludwigshafen, opposite Mannheim, seat of the celebrated Badische Anilin- und Sodafabrik; Leverkusen on the right bank of the Rhine below Cologne (Bayer Works); Frankfurt-Höchst on the Main (Höchster Farbwerke); Merseburg near Halle on the Saale (Leuna Works); Berlin. These works—each of them a large combination of production units—and many smaller ones throughout Germany were united in the super-trust of the famous 'I. G. Farben-Industrie' until 1948.

The German textile industry (wool, cotton, silk, rayon) is less dependent on waterways. It not only crowds the outskirts of the Ruhr district, as in Wuppertal (woollens and silks) and Krefeld (which ranks next to Lyons and Milan for silks and velvets), but is scattered very nearly all over Germany. Aachen is famous for its woollen cloth (not worsted); Chemnitz, the Saxon Manchester, is a

great seat of cotton and other textile industries and of the manufacture of machinery; Breslau, Liegnitz, and Görlitz are the chief manufacturing centres in Silesia (the first two now in Polish territory); there are many centres in Thuringia; hosiery flourishes in Saxony and Württemberg (Stuttgart, &c.); Plauen, on the Vogtland plateau in south-west Saxony, is the chief seat of cotton embroidery in Germany; Augsburg, south of the Danube, is a cotton spinning and weaving centre of prime importance.

The importation of cotton is centred on Bremen, which has a cotton exchange. Great progress has been made in the production of rayon. Not only have other textile works been converted for the purpose, but new factories have been established. As these require a great deal of water and pulp wood, they are preferably situated beside rivers and near forest areas. Typical examples are a large factory on the banks of the Main south of Aschaffenburg, between the Spessart and Odenwald forests; another at Kelheim, on the Danube, near the Bohemian forest; and a third at Waldhof, near Mannheim.

Another industry exclusively based on highly skilled and specialised labour, independent of traffic facilities or the location of minerals, is the manufacture of fine mechanical instruments, such as clocks and watches, musical and optical instruments, jewellery, and toys. Skilled labour is not only found in or near the larger towns, but is also concentrated in certain mountainous and agriculturally barren districts. It is the inheritance of a former home industry based on wood supplied by the Black Forest, the Thuringian Forest, and the western Erzgebirge. Although wood as material for clocks or musical instruments has long since been replaced by steel or tinplate, the manufacture of clocks, watches, and musical instruments has not shifted to the communication centres. So Schramberg, a small town of a few thousand inhabitants, is not only the centre of the clock industry in the Black Forest, but its centre for Germany as a whole, and its skilled labour has attracted also part of the modern German machine-tool industry. Similarly Sonneberg, in the Thuringian Forest, and Marktneukirchen and Klingental in the Erzgebirge, have specialised in toys and musical instruments.

The optical and machine-tool industry is found in large and small towns alike. Some of these works are world famous, *e.g.* the Leitz Works at Wetzlar on the Lahn (Leica). The jewellery of Pforzheim, on the northern outskirts of the Black Forest, dates from 1767, when it was founded as a mercantile enterprise by the Margraves of Baden. At least 30,000 persons living in the city (population 80,000) or in the vicinity were employed in this industry. Other notable industries are the porcelain manufactures of Meissen (Dresden china), Berlin, and Munich, famous for their luxury china. House-

hold or industrial china (for chemical factories) is chiefly produced in north-eastern Bavaria at the Czech frontier, where Selb (among many other places) is the centre. An extensive leather industry is carried on chiefly in the south. Offenbach, near Frankfurt, is famous for its export of luxury leather articles.

For electrical installations the natural conditions are fairly favourable in Germany. The natural water-power has been increased by the formation of artificial lakes in valleys where dams could be erected. Here Germany took an early lead. A lake was formed in the Edertal, south-west of Kassel, with a capacity of about 6,200m. cubic feet; one in the Möhnetal, an eastern tributary of the Ruhr in Westphalia, with a capacity of about 4,200m. cubic feet; one in the Urfttal, in the Eifel, with a capacity of about 1,600m. cubic feet; and many others. Still more important are the great Walchensee power works in the Bavarian Alps. The development of hydro-electric power has done much for German industry during the last twenty years. The most valuable asset is the power of the swiftly flowing Alpine rivers south of the Danube, the Iller, Lech, Isar, and Inn. Here construction of new power stations has been going on without a break, even under wartime conditions. Swiss capital erected a number of power works on the Upper Rhine upstream of Basel, on the German as well as the Swiss banks of the river, and the available electrical power of the Rhine is used by the Swiss-owned Lonza works. Water-power has also developed the hydro-chemical industry near the Inn, the most modern plants being situated at Gendorf (lubricants, acids), Töging (aluminium), and Trostberg (nitrates).

The exchange of electrical current across the international frontiers is a special branch of international trade and shows the interdependence of Germany and her neighbours. Switzerland and Austria are the chief exporters of electrical current. The German import of electrical current from these two countries rose to over 1,000m. kwh. in 1935. Germany's exports of current in the reverse direction were relatively small, and so were her exchanges in both directions with France, Poland, and Czechoslovakia.

In spite of the impressive amount of installed water-power, the energy available in Germany in this form before the Second World War was little more than one-fifth of the electrical energy from steam-power works (in 1935, 5,800m. kwh. compared with 27,600m. kwh.). Berlin and Nuremberg were the centres of the electrical industries. In 1951, Western Germany's output of electric power was 31,500m. kwh.

The ever-growing industrialisation made it necessary for Germany to cultivate and enlarge her foreign trade relations. The growth of overseas trade involved the growth of shipping, and a vast shipbuilding industry arose to meet the need. The biggest

establishments were at Hamburg, Bremen, Stettin, Kiel, Elbing, and Königsberg. Every type of craft from the trawler to the trans-oceanic liner was constructed. In 1914 Germany, with 5,000 vessels totalling over 5m. gross tons, stood second in rank to the United Kingdom among the world's mercantile marines. This position was lost in the First World War, but a new growth brought Germany into the fifth place again in 1937, with 3,600 vessels of about 4m. gross tons. This position, in turn, was lost in the Second World War, and once more Germany is engaged in building up her maritime strength.

Outlets for foreign trade. In her overseas trade Germany is in part dependent on foreign ports, particularly Antwerp and Rotterdam, both of them most conveniently situated for the commerce of the mining and manufacturing region of the Ruhr and the adjacent districts. The number of German ports accessible to ships of any size is limited to the estuaries of the big rivers and even these have had to be adapted by ingenious devices to modern shipping. Amongst them Hamburg is paramount, Bremen ranks second, while Stettin (now in Polish occupation and renamed Szczecin), Königsberg (now taken over by Russia and renamed Kaliningrad), and Emden vied with each other as to which should be next in succession. Hamburg's sea-borne trade in 1936 amounted to 28,800 vessels with a capacity of 32·7m. net tons, that of Bremen to 13,500 vessels with a capacity of 15·6m. net tons. Hamburg's advantages are its excellent water communications up the River Elbe to eastern Germany and into Czechoslovakia, which last country has a special Free Port area in Hamburg. As the Lower Elbe, since the beginning of this century, has had sufficient depth of water for the largest vessels, the outport of Cuxhaven lost much of its former importance and only served as a convenient embarking point for trans-oceanic passengers. Even the biggest Hamburg-America liners began their voyages in Hamburg itself. On the other hand, Bremen is reached only by smaller vessels, and before the war its outport of Bremerhaven was the starting point of the transatlantic services based on that port. Hamburg trades in all commodities; Bremen has specialised in certain less bulky goods, *e.g.* cotton (as already mentioned, it has a cotton exchange), tobacco, tea, and coffee. Bremerhaven, moreover, is the most important fishing port in the country and the home of a large trawler fleet.

Incidentally it should be noted that the transport for much of Germany's trade with her neighbours is provided by the railways, especially when the rail connections are far shorter than those by sea. Trade with Italy is carried mostly by rail across the Gotthard or Brenner Passes, even with such bulky commodities as coal, while in return Italian exports of fruit and vegetables are only practicable by rail.

To the present day Hamburg and Bremen have retained their self-government as free cities. They now have the status of German '*Länder*' (federal states) and an administrative reform effective from April 1, 1937, eliminated administrative borders which cut through economic units. The former Prussian neighbouring cities of Altona and Harburg were united with Hamburg proper, as were also a few other municipal and rural districts, to form the territory of Greater Hamburg, which even after the war had a population of a million and a half. Cuxhaven, as of little importance to the city, was detached from it and united with the province of Hanover, now Lower Saxony. Bremen, on the other hand, retained its outport of Bremerhaven, and by the addition of the Prussian ports of Geestemünde and Lehe, already forming a continuous settlement, was given new possibilities of development. Its population was reduced by the war to less than half a million.

Changes in population. Industrialisation has thoroughly altered the social structure of the population. In 1875, out of a total of about 43m., 26m. or 61 per cent. lived in rural communities of less than 2,000 inhabitants. With the development of industry people began, as usual, either to concentrate in the towns or to set up works in the country. As usual, also, the agricultural population not only failed to increase but lost ground. In the year 1900 there were still nearly as many people (25.5m.) living in rural districts, but they formed only 46 per cent. of the total; while by 1933 the number had fallen to 21.6m. and was only 33 per cent. of the total. In the latter year, whereas agriculture and forestry employed 13.6m. persons (21 per cent. of the total), industry and handicrafts employed 25m. (39 per cent.), and commerce and transport 11m. (17 per cent.). The growth of industry has provided employment for many millions of persons who would otherwise have had to go abroad.

In connection with the changing character of the population, there is some difference between the two republics composing post-war Germany. Western Germany, as now constituted, had in 1939 an agricultural population of 10m., forming 26 per cent. of the Western total; in 1946, when the total was larger, the number of the agricultural population had fallen to 8m. and was only 18 per cent. of the whole. On the other hand, in Eastern Germany the agricultural population of 3m. in 1939 increased to 3½m. in 1946, and the proportion of the total was the same (20 per cent.) in both years.

The density of the population has steadily grown, and has even been increased by the effects of the two World Wars. In 1914 the population numbered 67m. The First World War brought about a territorial loss of 27,000 square miles out of the former 209,000 square miles, or 13 per cent., and a loss of population of about 4m.,

or 6 per cent.; so that the average number of persons to the square mile rose from 318 in 1914 to 344 in 1919. In 1939, over 69m. people were living in the 182,000 square miles of the Reich, or 382 per square mile. As noted at the opening of this chapter, the Second World War was followed by initial frontier adjustments, mostly in favour of Russia and Poland, reducing the area of Germany within the four zones of occupation (British, American, French, and Russian) to 136,000 square miles. This was only three-fourths of the pre-war Reich, but in 1939 the same area carried a population of 59m., or six-sevenths of the total for the Reich, the density being 431 to the square mile. Losses during the war were very heavy, but after the war a new factor came into play, adding to the pressure of population in the occupied territory. This was the influx of German refugees from outside territories: the mass movement of displaced persons compulsorily ejected from their homes in surrounding lands. Already in 1946, when a census was taken, the population of the occupied territory was over 65m., making the average density 477 to the square mile.

Of the two republics which were proclaimed in 1949, Western Germany, as already noted, is more than double the size of Eastern Germany, which is limited to the Russian Zone. Geographically, Berlin falls within Eastern Germany, but politically it is a territory apart, a microcosm of occupied Germany as a whole, divided internationally into British, American, French, and Russian sectors, and administratively into two areas—East and West. Exclusive of Berlin, Eastern Germany is less densely populated than Western; in 1946, with a population of 17·3m., it carried 420 persons to the square mile, whereas Western Germany, with a population of 44·6m., averaged 471 to the square mile. Inclusive of Berlin, with its 3·2m. people in less than 344 square miles, Eastern Germany was even more densely populated than Western in 1946, averaging 492 persons to the square mile. Data are lacking for the present position in Eastern Germany, but Western Germany, which is the goal of most of the refugees, has continued to attract them in large numbers, and its census population of 47·5m. in 1950 represented an average of 502 to the square mile. It was estimated in 1951 that since the end of the war over 9m. refugees had arrived in Western Germany, and from 800 to 1,000 were still arriving daily. Unemployment, which amounted to 2m. early in 1950, dropped to about 1m. in the summer of 1951.

The following table, though not going beyond 1948, shows how big a factor the refugee movement has been in the population of Western Germany since the Second World War.

Western Germany is now predominantly an industrial State, while Eastern Germany, though largely agricultural, also has a considerable industrial sector, as suggested by the absence of any

Occupation Zone.	Population in millions.		Percentage of change 1939-48.	Percentage of refugees Sept. 1948.
	May 1939.	Sept. 1948.		
British . .	19.8	23.7	+20	18
American . .	14.3	18.0	+26	19
French . .	5.25	5.1	—3	No data
Western Germany	39.35	46.8	+19	—

marked dissimilarity between the density of population in the two republics. The following comparison is instructive:

Leading Industrial Exports from Germany in 1936

Percentages from the respective territories of the present-day republics

Class of Export	Originating in	
	Western Germany	Eastern Germany
	Per cent.	Per cent.
Iron and steel products . . .	96.2	1.7
Mining products . . .	84.5	7.9
Iron wares, cutlery . . .	85.5	13.9
Chemical industry . . .	75.9	23.5
Machinery . . .	57.2	40.6
Textiles . . .	51.5	45.6
Earthenware, glass . . .	46.5	46.9
Electrical engineering products .	40.5	58.1
		(Berlin 48.0)

Foreign Trade. In 1913, before the First World War, the total of foreign trade was more than 20,000m. marks (£1,000m.). Imports were slightly higher than exports; payments from capital investments abroad made up the difference. After the war, the need to export increased, and from 1925 to 1931 the foreign trade was even higher than in 1913. Foreign investments were no longer available to pay for an excess of imports; on the contrary, there was a considerable excess of exports, but these included a high percentage of reparation goods for which no payment was received: commercially the foreign trade was still unbalanced and had to be backed by foreign loans. In these circumstances the shock of the world economic crisis of 1931 had a disastrous effect on economic life in Germany. Unemployment rose to an alarming height (6m.) and political unrest had a fruitful field for growth. German foreign trade never recovered, before the Second World War, from the blow it suffered in 1931-32. Its total value (imports and exports), which stood at RM. (Reichsmarks) 22,000m. in 1930, was only about half that amount in 1938, and had been considerably less in the interval.

The following abridged list of the most important imports and exports in 1936 illustrates what has been said about Germany's pre-war development along industrial lines—her dependence on other countries for foodstuffs and raw materials, and the preponderance of industrial products among the goods supplied in return.

CHIEF ITEMS IN GERMANY'S FOREIGN TRADE, 1936

Commodities valued at more than RM 100m. (approximately £8m.)

IMPORTS (Approximately £350m.)			EXPORTS (Approximately £400m.)		
Commodities	Value Millions Sterling.	Percent- age of total.	Commodities	Value Millions Sterling.	Percent- age of total.
Raw textiles .	49.0	13.9	Machinery (not electrical) .	50.5	12.8
Ores .	24.0	6.9	Semi-finished chemicals .	35.0	8.8
Timber, pulp .	21.0	6.0	Coal and coke .	32.0	8.2
Fruit .	20.0	5.8	Steel wares .	32.0	8.1
Furs, hides, leather wares .	19.5	5.5	Semi-finished iron wares .	30.0	7.0
Oil-seeds .	19.0	5.4	Electrical engin- eering products	21.5	5.4
Metals, including scrap, alloys .	16.0	4.3	Textiles (fabrics)	18.0	4.4
Gasoline, lubri- cants .	14.0	4.0	Chemicals, finished products .	15.0	3.6
Semi-finished textiles .	11.5	3.4	Vehicles (automo- biles, etc.) .	14.0	3.5
Coffee, tea .	11.0	3.2	Textiles (knitted wares, clothes)	13.5	3.4
Tobacco, tobacco products .	10.5	3.0	Paper, cardboard wares .	12.5	3.1
Milk, butter, cheese .	10.5	3.0	Wares of non- ferrous metals	11.0	2.7
Meat, meat pro- ducts .	10.0	2.9	Textile, semi- finished goods	9.0	2.4
Above imports	£236m.	67.3	Chemical semi- finished goods	8.5	2.0
			Above exports	£302.5m.	75.4

This list omits one item, grain and corn, which in former years used to rank high on the import schedule. In 1936 its value was only £3.6m., to which amount this item had fallen from £13.5m. within two years.

There are no comparable post-war figures available, but the following returns of the trade of Western Germany in 1950 show the same general characteristics.

Western Germany: Special Imports (c.i.f.) and Special Exports (f.o.b.), 1950
(Sterling rate of exchange: DM. 11.76 to the £)

Imports: Total, DM. 11,374.6m. (£967.2m.)			Exports: Total, DM. 8,362.1m. (£711.1m.)		
<i>Classes of imports</i>	Deutsche Marks (millions)		<i>Classes of exports</i>	Deutsche Marks (millions)	
Livestock	228.2		Livestock	21.8	
Foodstuffs:			Foodstuffs:		
Animal origin	1,276.9		Animal origin	25.9	
Plant origin	3,100.5		Plant origin	70.0	
Raw materials	3,367.9		Raw materials	1,167.8	
Semi-manufactures	1,564.7		Semi-manufactures	1,567.4	
Finished goods	1,428.6		Finished goods	5,422.3	
Non-essential goods	407.8		Non-essential goods	77.9	
	11,374.6			8,362.1	
<i>Countries of Production¹</i>			<i>Countries of Consumption²</i>		
U.S.A.	1,734.5		Netherlands	1,164.1	
Netherlands	1,246.4		France	766.7	
France	872.4		Belgium-Luxembourg	677.0	
Sweden	636.8		Sweden	531.2	
Italy	507.3		Switzerland	492.3	
United Kingdom	488.9		Italy	486.4	
Belgium-Luxembourg	404.8		U.S.A. . . .	430.1	
Denmark	490.7		United Kingdom	360.9	
Switzerland	350.3		Denmark	353.4	
Argentina	275.3		Austria	311.6	
Australia	268.2		Turkey	236.9	
Indonesia	233.7		Yugoslavia	156.4	
Malaya	231.7		Brazil	147.4	
Norway	217.1		Greece	135.6	
Turkey	218.6		Hungary	132.0	
French Morocco	187.5		Norway	119.1	
Austria	178.3				
Union of S. Africa	123.6				
	8,671.1			6,501.1	
Percentage of total	76.2		Percentage of total	77.7	

¹ Countries providing Germany with imports to the value of over £10m. (DM. 117.6m.).

² Countries using exports from Germany to the value of over £10m. (DM. 117.6m.).

Like other war-stricken countries Germany is confronted by many problems, but the most serious obstacle to recovery, in the long run, seems likely to be the partition of the country into East and West Germany. More important than the fact of partition are the economic differences to which it has given rise, and the artificial barriers set up between the two areas. In the Soviet Zone all the more important industrial establishments have been expropriated and turned into public-owned enterprises (*Volkseigene Betriebe*). In commerce a state-owned Commercial Organisation

(*Handelsorganisation*) has taken over practically all activity. The elaborate railway system has been reduced by converting every double-track line into single-track. Mention has already been made of the expropriation of large estates for division into small holdings, and the resultant position of agriculture.

The situation in the Western German Federal Republic is different. The problem of rehabilitation and resettlement of millions of refugees intensifies the predominance of industrialism. There is no more land for agricultural settlement worth mentioning. Crop yields cannot be expected to increase considerably under present conditions. Thus the solution of the problems can only be found in the expansion of industry and foreign trade.

About 3m. Germans were evacuated from Poland.

POLAND

The present Republic of Poland, traversed from south to north by the River Vistula, is approximately one-fifth smaller than the State existing before the Second World War. Pre-1939 Poland, created by the Treaty of Versailles, comprised all the areas inhabited wholly or mainly by people of Polish speech: areas which until 1919 had been divided between Russia, Austria, and Prussia since the three partitions of the former Kingdom of Poland towards the end of the eighteenth century. In the Second World War, Poland was overrun by German and Russian troops, finally allying itself with Russia; and at the close of the war the country was reconstituted and its frontiers were redrawn. Though still (1953) unratified by a peace treaty, the new frontiers are generally recognised. The western frontier was moved westwards at the expense of Germany to the Oder and Neisse rivers, taking in Breslau (now Wrocław), and crossing the Oder in the far north to include the former German port of Stettin (now Szczecin). The northern frontier was also extended to include the southern part of East Prussia, together with the former Free City of Danzig. At the same time the eastern frontier was moved westwards so as to give U.S.S.R. a large slice of Polish territory, including the cities of Lvov and Brest-Litovsk and the oil-wells of Boryslaw and Drohobycz. By these changes Poland acquired 40,000 square miles of territory on the west and north, and gave up 70,000 square miles on the east. Within her new borders she has an area of 121,000 square miles and a population (1950 census) of just on 25m.; in other words, she is almost exactly the size of Great Britain and Ireland and carries rather less than half their population. Under 2 per cent are non-Polish.

Generally speaking, the country rises gradually from north to south and may be divided into four unequal parts: (1) in the north

there is a part of the Baltic lake country, replaced to the west of the Vistula by the sandy Baltic Heights; (2) occupying a broad strip from east to west is the glaciated plain, comparable with the neighbouring plains of Germany and Russia; (3) a short distance south of Warsaw begin the Polish plateaus—low plateaus covered with fertile loess soils; (4) finally appear the foothills and lower slopes of the Carpathians in the south, and the Sudeten Mountains in the south-west, with the Moravian Gate between them. The whole area contains a large proportion of arable land, and this is especially true of the middle belts; in the north-west there are considerable tracts of poor land under coniferous forest.

On the outbreak of war in 1939 agricultural production dropped, and with the systematic destruction of the country during the war, the level of production remained low until the war ended. Since 1945, figures for all the principal crop yields have climbed gradually back towards their pre-war rates. Rather more than half the total area is arable land, combined with a sprinkling of orchards, and nearly a quarter is covered with forests. Of the remaining quarter, one-half consists of pastures, and the balance is made up of built-on areas, waste lands, etc. By far the most extensive crop is rye; it accounts for a third (13m. acres) of all the land under field crops, covering a larger area and producing a heavier crop (between 6m. and 7m. tons) than wheat, oats, and barley combined. Barley has lagged behind since the war; it is the only one of the four main cereals which by 1950 had not approached or surpassed the pre-war area and production.

Potatoes are the most extensive crop after rye—and a very much heavier crop; they are cultivated on between 6m. and 7m. acres and yield a harvest of up to 40m. tons. Sugar-beet is even more prolific; from between half and three-quarters of a million acres it produces some 6m. tons. A crop which might not be expected in Poland is tobacco; it is relatively small, but quite appreciable, and though the yield per acre is not what it was, the cultivated area since the war has been from thirty to forty thousand acres and the production around 20,000 tons.

As well as agriculture, the pastoral industry suffered severely in the Second World War, but the numbers of livestock have increased again, though cattle—the most important branch—have been slower than others in catching up. At the census in December 1950 the numbers returned were: cattle, 7.2m.; sheep, 2.2m.; horses, 2.8m.; pigs 9.9m.

According to the foregoing statistics, farming in Poland has been largely restored to its pre-war standard; but relatively its position is very different. Poland has been changed by the war from a predominantly agricultural country to one in which agriculture and industry are of equal importance. The change-over has

been effected partly by nationalisation and State planning of industries, but also by the acquisition of large 'ready-made' industrial areas from Germany as a result of the westward shift of the German-Polish frontier. The greater part of the Upper Silesian coal-field was ceded to Poland after the First World War, and the remainder has now become Polish territory; so also has the Lower Silesian coal-field; moreover in the Silesian area are iron, zinc, silver-lead, copper, and salt mines, while the salt mines of Wieliczka and Bochnia, to the south and east of Cracow (Krakow), are a further source of mineral wealth. Over 80m. tons of coal and over 800,000 tons of iron ore were produced in 1951, the output of pig-iron in that year being nearly 2m. tons. Zinc output is large.

Besides raw products, Poland turns out large quantities of manufactured goods. Its extensive forests supply not only timber, but the material for the manufacture of wood-pulp and paper. The textile industry is especially important. Output in 1948 included 80,000 tons of cotton yarn, and 375m. yards of cotton fabrics; also 35½m. yards of woollen yarn and 46m. yards of woollen fabrics. Various manufactures are carried on at the two chief Vistula towns of Warsaw (Warszawa), the present capital, and Cracow, a much earlier capital, as well as at Poznan (Posen). One of the chief seats of manufactures, especially of textiles, is Lodz, situated west-south-west of Warsaw. The town has grown with remarkable rapidity. The whole textile industry of Poland was due to a series of government decrees of 1816 to 1833, which had the effect of settling there a number of German (principally Saxon and Silesian) artisans and industrialists, and the growth of Lodz is the result of these settlements. It is difficult to find any local advantages to account for its situation. Till shortly before the First World War none of the great railway lines passed through it. It is 88 miles from Warsaw, and 22 miles by rail from the junction on the Warsaw-Vienna line, which was then on a different gauge, so that the transport of coal, which had to be carried 140 miles to the town, involved a break of bulk.

Nowadays some 85 per cent. of Poland's 17,000 miles of public railways are of standard gauge. Other means of transport include 60,000 miles of hard-surface roads and 100,000 motor vehicles, of which 40 per cent. are motor trucks, the others being equally divided between passenger cars and motor cycles. Navigable inland waterways extend to nearly 2,500 miles.

The Silesian towns include the important industrial centres of Chorzow, Katowice (Stalinogrod), and Tarnowskie Gory, all with iron blast furnaces, the first two also with extensive zinc works, the third with silver-lead refineries; the coal-field and metal-working towns of Gliwice (Gleiwitz), Raciborz (Ratibor), and Bytom (Beuthen); the textile towns of Lower Silesia (Dzierzoniow, Luban,

Zary and Jelenia Gora); and the river port and communications centre of Wroclaw (Breslau), at the head of navigation on the Oder.

Following the establishment of the new State of Poland after the First World War, commerce grew rapidly. Large sums of money were spent on developing the former fishing port of Gdynia into a port rivalling the Free City of Danzig (Gdansk). Since the incorporation of Danzig into Poland as a result of the Second World War, the two ports have been amalgamated and now function jointly as the country's principal port. Other ports are Szczecin (Stettin), Kolobrzeg (Kolberg), and the river port of Elblag (Elbing). Details of the trade are scanty, especially as regards the value of individual items. The unit of national currency, the zloty, experienced the post-war depreciation suffered by the currencies of so many countries, and in 1950 was revalued on the basis of 100 old to one new zloty, the latter equivalent to a Soviet rouble (nominally 25 U.S. cents, actually worth 4). The only post-war figures available for imports and exports by value are the totals in American dollars, which register a rapid recovery of trade. Imports increased from \$34m. in 1945 to \$633m. in 1949, and exports from \$38m. in 1945 to \$679m. in 1949. The 1949 totals are nearly 50 per cent. more than the dollar values of the imports and exports in 1930, before the great slump, and considerably more than double (treble in the case of exports) the totals for 1938.

Details of the individual imports and exports by weight were available till 1948, but in 1949 even these particulars were supplied only for groups of products. The total weight of imports in 1949 was 5½m. tons, of which minerals—mostly iron ores—accounted for more than half (2¾m. tons). Other imports included a million tons of fertilisers and nearly half a million tons of timber, mostly pit-props. The weight of the exports was very much greater—35m. tons, mostly accounted for again by minerals (33m. tons), of which the great proportion was coal (26¾m. tons). Other exports included over a million tons of grain and other foodstuffs of plant origin, including sugar; half a million tons of timber; and a third of a million tons of iron and steel and other base metals and products.

While, as regards commodities, values of only gross imports and gross exports are made available, there is not the same reticence about the value of the trade with individual countries. U.S.S.R. has taken the place of Germany as principal trader with Poland, providing in 1948 nearly a quarter of the imports by value and receiving a fifth of the exports. The other chief countries of supply were, in order, Czechoslovakia, Sweden, the United Kingdom, Germany, the United States, and Yugoslavia; while the chief customers (after U.S.S.R.) were Sweden, the United Kingdom, Czechoslovakia, Germany, France, Denmark, Finland, and Yugoslavia. As will be seen from the following table, the import value and/or export value of

each of these countries to Poland in 1948 exceeded \$20m. These were the only countries whose trade in either direction reached that value.

Special Imports (c.i.f.) and Special Exports (f.o.b.), 1948

Imports: \$509.5m. (£182m.)			Exports: \$528.1m. (£188.5m.)		
Countries of Origin.	U.S. \$ (millions).	Percent- age of total.	Countries of Destination.	U.S. \$ (millions).	Percent- age of total.
U.S.S.R. . . .	117.9	23	U.S.S.R. . . .	110.7 ²	21
Czechoslovakia . .	53.1	10	Sweden . . .	66.6	12
Sweden . . .	45.1	9	United Kingdom . .	43.5	8
United Kingdom . .	41.6	8	Czechoslovakia . .	43.2	8
Germany . . .	31.0	6	Germany . . .	41.1	8
(West and East)			France ³ . . .	31.5	6
U.S.A. ¹ . . .	29.8	6	Denmark ³ . . .	29.7	6
Yugoslavia . . .	26.1	5	Finland ⁴ . . .	24.3	5
			Yugoslavia . . .	21.6	4
Above countries	344.6	67	Above countries	412.2	78

¹ The United States' contribution to the export side of the account is about a quarter of 1 per cent. of the total.

² Does not include coal shipped to U.S.S.R. under special agreement.

³ France and Denmark each contribute to the import side of the account about 2½ per cent. of the total.

⁴ Finland's contribution to the import side of the account is about 1½ per cent. of the total.

TOWNS WITH OVER 100,000 INHABITANTS IN 1950

Warsaw	600,767	Bydgoszcz	156,108
Lodz	592,559	Chorzow	130,901
Cracow	347,048	Zabrze (Hindenburg) . .	128,005
Poznan	291,577	Czestochowa	115,084
Wroclaw (Breslau) . .	279,373	Gliwice (Gleiwitz) . . .	113,517
Gdansk (Danzig) . . .	169,675	Bytom (Beuthen)	112,336
Szczecin (Stettin) . .	159,122	Gdynia	111,147
Katowice	156,001	Lublin	101,888

SWITZERLAND

The two republics of Switzerland and Austria embrace the greater part of central Europe covered by the Alps, though neither of them is confined to the area so occupied. An important feature of both is that they are traversed by the ancient routes, now in some cases followed by railways, connecting the most densely peopled areas of north central Europe with the most populous of the Mediterranean peninsulas.

From a commercial as well as from other points of view Switzerland is a remarkable little country. Covering 16,000 square miles (twice the size of Wales), with little coal and little iron, it is pre-eminently a manufacturing country in the modern sense of the term, manufactured articles forming the greater part of its exports, raw materials and food supplying the bulk of its imports. Situated in the heart of Europe, it sends its silks and cottons and its watches to the United States and South America as well as throughout Europe—France, Italy, Sweden, the United Kingdom, Germany.

None the less, Switzerland is essentially a land of mountains; five-sevenths of the surface is divided between the Alps and the Jura, with the Alps occupying the whole of the south-east, and the Jura stretching along the north-west; while in between lie the populous Swiss midlands. The country has a population of between four and five millions—almost double that of Wales, and consequently with much the same density. Even the most thinly peopled mountain canton has an average of 47 people to the square mile. Racially, three main strands are woven into the population; over 70 per cent. are German-speaking, 20 per cent. French-speaking, and 5 per cent. Italian-speaking. Four national languages are recognised—the three already mentioned, and Romansch (between 1 and 2 per cent.).

Climate and crops. The climate of the Swiss midlands allows the same crops to be grown as in the adjoining parts of France and Germany. An abundance of wine of good quality is produced for the home market in most of the cantons, notably in the south-west (Vaud and Neuchâtel), and there is a sizable but uncertain export of fresh fruit (apples and pears), which since the war has varied from $\frac{1}{2}$ m. to $4\frac{1}{2}$ m. bushels a year. But on the whole, the moistness of the climate, due to the mountainous character of the country, together with the exposure to moisture-bearing winds on both slopes of the mountains, causes Switzerland to be more extensively adapted for pasture grasses than for the growing of food crops, wine, and fruit. Excluding its lakes, the republic has a land area of nearly 10m. acres, but no more than 12 per cent. (1.2m. acres) ranks as arable, and even of that getting on for half is classed as 'temporary meadows,' while permanent meadows and pastures comprise as much as 42 per cent. (4.2m. acres). Forests and woodlands cover 25 per cent. (2.5m. acres), and the balance of about 20 per cent. (2m. acres) is made up of waste and built-up areas.

The area devoted to field crops is about 660,000 acres (rather more than a thousand square miles), and production is far short of home needs. About a third of the crop-land is under wheat, yielding harvests of from under 200,000 up to 250,000 tons (7m. to 9m. bushels). Potatoes, the next most widely grown crop, covering an area which rose during the war to over 200,000 acres and produced

over 1½m. tons a year, are normally grown on less than 150,000 acres and yield around three-quarters of a million tons. Vineyards occupy about 30,000 acres. The sugar-beet crop is one of the smallest in Europe.

Livestock are not in general very numerous; cattle are an outstanding item, totalling 1½m., more than half of them cows. There is a large production of cheese (50,000 tons), a useful export; and other dairy produce (condensed milk, &c.) is exported on a smaller scale. Breeding stock belonging to races of cattle for which Switzerland has a high reputation, as well as cattle for fattening, find a market abroad; but these exports of live animals are far exceeded by the import of livestock from Denmark, the Argentine, the United States, and other countries.

Manufacturing industry. As indicated at the opening of this survey, Switzerland is not rich in minerals. Iron ore and manganese ore are worked on a small scale in the Gonzen mine (St. Gallen); salt is worked at various places, notably at Bex, in the canton of Vaud, above the Lake of Geneva; asphalt and cement are also produced. It is not an impressive list, but for the prosecution of its manufacturing industries and handicrafts Switzerland has certain advantages of its own, the principal being the abundance of water-power and of skilled labour. The government has done much to keep up the quality of the labour by providing for efficient technical education. To these advantages may be added the commercial position of Switzerland, more particularly of northern Switzerland, which lies at the intersection of the great routes connecting northern Italy with the middle Rhine valley, and the lower Rhone valley with that of the upper Danube; but this advantage is diminished by the smallness of the home market. Now that production on a large scale is of so great economic importance, it is adverse to Swiss industries that a customs barrier is encountered on all sides within so short a radius.

The Swiss have taken a leading part in the development of hydro-electric power. Since 1894 they have increasingly utilised in this way their wealth of water-power, setting up large power stations in many parts of the country, notably on the Rhone, just below Geneva; on the Rhine, between the Lake of Constance and Basel, at Schaffhausen, Neuhausen, and Rheinfelden; at Brugg on the Aar and Baden on the Limmat; and at Berne. At the close of the First World War, the water-power potentially available in Switzerland was estimated at 4m. h.p., of which about one-fifth was then utilised. In 1939, production amounted to 7,100m. kwh., of which nearly one-fourth was exported. The Second World War brought about a big increase in demand, owing to the shortage of coal and other fuel imports. Developments (which are still in progress) were put in hand, and at the close of the half-century, over

6,000 electrical power plants had a capacity of 2½m. kw., and the yearly output was 10,500m. kwh. Most of the factories are electrically run, while all the 3,245 miles of railway have been or are being electrified.

The manufactures and handicrafts in which Switzerland particularly excels are those in which the value of the labour, or the whole cost of elaborating the raw material, is high in proportion to that of the material itself. Almost every branch of the machinery industry is carried on, but more particularly the manufacture of textile machinery, electrical machinery (at Oerlikon, near Zürich, and at Baden), and hydraulic machinery. All the leading places engaged in this industry are in the commercially favoured northern district previously indicated. The value of Swiss exports under the head of machinery and locomotives in 1911 was already double that of the imports, and that proportion has been maintained up to the half century, when the export of machinery, including motor vehicles, provided more than a fifth of the total export trade (see table on p. 437).

Watch- and clock-making is a close second to the heavy machinery industry, providing about a fifth of the exports, mostly in wrist watches. Watch-making is principally carried on in the Swiss Jura, where it has been practised since the beginning of the eighteenth century and where there is a high degree of hereditary skill, now combined with the most advanced organisation. Formerly hand labour was exclusively employed in Swiss watch-making, but the keenness of foreign competition led to the establishment of factories with the necessary mechanical appliances. The chief seats of the industry are Le Locle and La Chaux de Fonds in Neuchâtel; Bienne, St. Imier, and Porrentruy in Berne; Grenchen in Solothurn; and Geneva, which is one of the chief trading as well as manufacturing centres.

Third in importance, as a factor in the export trade, is the textile industry, in which cotton and silk are closely related. Switzerland's early success in the silk industry was largely due to the dexterity with which cheaper materials, principally cotton, were worked up along with the more costly silk. Incidentally, it should be noted that silk is one of the raw materials of which the supply was greatly cheapened through the construction of the St. Gotthard railway, leading direct to the great silk market of Italy. In cotton-spinning, Switzerland produces a great quantity of fine yarn in proportion to the number of its spindles, and the cotton fabrics for which it is chiefly celebrated are trimmings and embroideries. These early successes paved the way for the now very important rayon and more recent nylon industries.

The chief centres of the Swiss silk industries are Zürich and Basel. Cotton manufactures are mainly carried on in the north-

east, in Zürich and the adjoining cantons, but there are numerous bleaching, dyeing, and printing establishments in the canton of Glarus, in some of the deepest Alpine valleys. Machine embroidery and lace-work are pursued chiefly in the cantons of St. Gallen, Appenzell, and Thurgau. St. Gallen, which has been noted for its hand embroideries (mostly on linen), as well as its linen manufactures, since the thirteenth century, is now the centre of the industry not merely for Switzerland, but for the neighbouring parts of Austria (Vorarlberg), the little principality of Liechtenstein, and Bavarian Germany, where similar conditions prevail; small peasant farmers and their families supply much of the labour, and recruit within the industry labour for their farms in harvest time. The embroidery machine was introduced into St. Gallen in 1840, and it is since then that the industry, which is still partly domestic, has grown to its present magnitude. The variety and richness of the patterns were enhanced through the introduction of the sewing-machine about a quarter of a century later.

The manufacture of chemical products, especially aniline dyes and drugs, is important at Basel, and use is made of Switzerland's water-power in the manufacture of aluminium (at Rheinfelden) and carbide of calcium. Swiss shoes, which are exported to many parts of the world, are noted for their quality and finish.

Communications. The nature of the surface presents great obstacles to internal communication between the midland tracts and various parts of the more sparsely peopled regions, and also to communication with the neighbouring countries in the east and south. Not till the nineteenth century was there any carriage road across the Alps, the first being that made by Napoleon across the Simplon in 1805 for the passage of his 'cannon' from the valley of the Upper Rhone to the banks of Lake Maggiore in Italy. Now the Swiss Alps possess some of the finest mountain roads in the world. The St. Gotthard road, for long the most important of all on account of the direct communication which it establishes between the most populous parts of Italy (with Milan as the chief centre), Switzerland, and Germany, was largely superseded by the railway which pierces the St. Gotthard group in a tunnel nearly ten miles in length (completed in 1882). By means of this railway the continental ports on the North Sea are brought to within a distance of three days for goods traffic from ports on the Mediterranean.

Till 1903 the St. Gotthard was the only one of the great Alpine tunnels constructed within Swiss territory, but in that year a tunnel $4\frac{1}{2}$ miles long was opened under the Albula Pass, leading from Coire to the Engadine, and in 1906 another $12\frac{1}{2}$ miles long under the Simplon (Brig to Iselle); also a second Simplon tunnel, begun in 1912, was opened in 1921. The Simplon tunnel has much easier gradients in its approaches than either the St. Gotthard or the

Mont Cenis tunnel. The highest point is only about 2,300 feet above sea-level (1,070 feet above the Lake of Geneva), while the summit of the St. Gotthard tunnel is 3,785 feet above sea-level (2,350 feet above Lake Lucerne). *Via* the Simplon, the distance between Milan and Paris is 519 miles, as compared with 559 miles by the St. Gotthard route. The Simplon route to northern France is greatly shortened by the Lötschberg tunnel (1913), which pierces the Bernese Alps for 9 miles and brings Berne directly on to the main route.

Commercial centres. Berne, on the River Aar, is the capital of the republic, but as will be seen below, the most populous towns are Zürich and Basel. These have the most commanding situations commercially—Basel on the German frontier, at the head of the plain of the middle Rhine; Zürich the centre of the most highly populated part of Switzerland and the converging point of railways of great importance—the St. Gotthard line, which runs thence southwards, and the eastern line through the Arlberg tunnel. Berne ranks third in population, and next to it comes Geneva, which stands in the narrow opening formed by the Rhone valley between the Alps and the Jura, and has the best situation in relation to Marseilles.

The central situation of Switzerland is one of the facts that have caused that country to be selected for the seat of several international bureaux and agencies. Among them are the International Labour Office (Geneva), the World Health Organisation (Geneva), the Universal Postal Union (Berne), the International Tele-communications Union (Geneva), the International Refugee Organisation (Geneva), and the World Meteorological Organisation (Lausanne)—all allied with the United Nations Organisation.

In overseas commerce the chief North Sea port made use of by Switzerland is Antwerp, especially in the case of the export trade, which is mainly in relatively valuable articles, for which inland water transport is unsuited. Rotterdam is a centre of import for grain, and in the high-water season trains of barges of 1,000 tons each can be hauled by tugs right up to Basel. Before the Second World War, Hamburg and Bremen handled much of the Swiss trade with transatlantic countries; now it nearly all passes through Havre, St. Nazaire, and Bordeaux. Marseilles and Genoa take the Mediterranean traffic, Lübeck that for the Baltic.

Imports greatly exceed exports in value, but against this must be set the value of the tourist traffic. Switzerland has not only its summer season, when the lakeside resorts are especially popular, but a season for winter sports, with numerous hotels at elevated situations (for instance, St. Moritz and Pontresina in the Engadine, and Davos). In 1950, only between four and five years after the Second World War, the number of foreign visitors to Swiss holiday

Switzerland: Special Imports (c.i.f.) and Special Exports (f.o.b.), 1950.

(Sterling rate of exchange: Sw. frs. 12.245 to the £)

IMPORTS: Total, Sw.frs. 4,535.9m. (£370m.)		EXPORTS: Total, Sw.frs. 3,910.9m. (£319m.)	
<i>Commodities</i>	<i>Million Sw.frs.</i>	<i>Commodities</i>	<i>Million Sw.frs.</i>
Foodstuffs:		Foodstuffs:	
Wheat	120.8	Cheese	84.6
Barley, oats, maize	120.7	Other dairy produce	3.1
Other grains, pulses, etc.	101.5	Apples and pears	6.2
Fruits and vegetables, fresh and preserved	186.2	Live animals	5.8
Live animals	49.7		99.7
Meats: fresh, frozen, and preserved	55.4		(2.5%)
Butter and eggs	78.3	Metals, machinery, and tools:	
Raw coffee, cocoa beans, sugar	288.1	Iron and steel pipes and fittings	11.5
Vegetable oils, oil-seeds, and fruits	145.0	Aluminium and manufactures	46.8
Wines	62.7	Boilers	35.0
	1,208.4	Machine tools	123.9
	(26.6%)	Dynamos, motors, pumps, etc.	137.9
Fuels:		Steam and internal combustion engines	117.2
Coal and Coke	187.4	Textile machinery	235.1
Petroleum residue	86.5	Food-processing and other machinery	185.3
Gasolene	68.2	Motor and other vehicles and parts	27.6
	342.1	Printing machinery	15.6
	(7.5%)		935.9
Metals, machinery, and tools:			(23.9%)
Iron and steel, and fittings	234.7	Watches and clocks:	
Copper and lead	62.9	Wrist watches	457.0
Machine tools and other apparatus	201.8	Watch movements	175.8
Motor vehicles	169.0	Other watches, clocks and parts	97.4
Aeroplanes	24.9		730.2
Office equipment (machines), radio, telephone and telegraph equipment	35.0		(18.7%)
	728.3	Scientific instruments:	
	(16.1%)	Optical and scientific instruments and apparatus	41.8
Textile Industry:		Electric computers	29.1
Cotton and cotton yarns	181.8	Other instruments and apparatus	187.0
Wool and woollen yarns	172.0		257.9
Fabrics: cotton, woollen, linen, silk, etc.	136.4		(6.6%)
	490.2	Textile industry:	
	(10.8%)	Cotton: Yarn and thread	45.2
Chemicals, drugs, dyes, colours:		Fabrics and embroidery	190.3
Pharmaceutical products	52.3	Silk and artificial silk:	
Other chemical products	152.8	raw and thread	78.4
Paints, varnishes, etc.	29.0	fabrics, etc.	116.4
	234.1	Apparel	53.8
	(5.2%)	Straw manufactures	22.2
Various:			506.3
Inedible oils, fats, waxes	109.1		(12.9%)
Hides, skins, leather	66.2	Chemicals, drugs, dyes, colours:	
Raw tobacco	62.7	Dyes and colours	230.2
Wood, timber, cellulose	52.7	Pharmaceutical products	225.5
Glass and glassware	31.7	Perfumery and cosmetics	28.7
Rubber tubes, tyres, etc.	30.4	Munitions and explosives	13.4
Fertilisers	29.5	Other chemical products	86.7
	382.3		584.5
	(7.1%)		(14.8%)
Total of above items	3,385.4	Various:	
	(74.6%)	Cigarettes	45.4
		Printed books	24.1
		Footwear	23.5
			93.0
			(2.4%)
		Total of above items	3,207.5
			(82.0%)

Switzerland: Special Imports and Special Exports, 1950 (continued)

IMPORTS		EXPORTS	
<i>Countries of Production</i> ¹	<i>Sw. frs. (millions)</i>	<i>Countries of Consumption</i> ²	<i>Sw. frs. (millions)</i>
United States	625.6	United States	515.4
France	510.8	Italy	515.2
Germany	497.2	Germany	362.2
United Kingdom	369.6	France	358.1
Italy	323.2	Belgium-Luxembourg	281.2
Belgium-Luxembourg	234.3	United Kingdom	136.6
Netherlands	159.3	Brazil	135.0
Union of S. Africa	142.1	Netherlands	114.5
Canada	133.6	Czechoslovakia	102.1
Argentina	124.7		
	3,120.4		2,520.3
<i>Percentage of total</i>	68.8	<i>Percentage of total</i>	64.4

¹ Countries providing Switzerland with imports to the value of over Sw. frs. 100m. (over £8m.).² Countries using exports from Switzerland to the value of over Sw. frs. 100m.

resorts was very nearly 2m.—no inconsiderable factor in the need to import cereals and other foodstuffs, though the main factor is the large numbers of the permanent population engaged in manufacturing industry. Before the First World War, Russia supplied most of the wheat and other cereals imported, but Canada and the Argentine have since come to be the chief sources of supply.

TOWNS WITH OVER 50,000 INHABITANTS IN 1950

Zürich	383,000	Lausanne (1947)	103,000
Basel	181,000	St. Gallen	67,000
Berne	142,000	Winterthur	66,000
Geneva	105,000	Lucerne	60,000

AUSTRIA

After the break-up of the Austro-Hungarian Empire in the First World War, Austria survived as a republic till 1938, when it was incorporated into Germany and became part of the Third Reich. In the Second World War, Allied armies liberated the country by May 1945; the Republic was re-established under a National Assembly and divided into four occupational zones, administered by Russia, the United States, the United Kingdom, and France, with the Allied Council in general control. Vienna was also split into four sectors.

Austria is a country of some 32,000 square miles (slightly larger than Scotland), supporting a population of seven millions. It is largely mountainous, being occupied in the south by the eastward extension of the Alps, but comprising in the north a section of the Danube basin, the Danube itself flowing across the country from west to east. About half the country (rather more than 10m. acres)

is classed as arable and pasture land, pastures being the more extensive (5½m. acres; arable 4½m. acres). Nearly half a million acres of the arable land are occupied by temporary meadows, and nearly a quarter of a million acres by orchards and gardens, but there remain over 3¾m. acres of cropland, half of which is devoted to the four main cereals: wheat, rye, oats, and barley. The only considerable areas suited to cereals are the Danubian tracts of Upper and Lower Austria. Rye is the most extensively grown, but wheat is not far behind in either acreage or production, each occupying over half a million acres and yielding over a third of a million tons. Oats, also occupying over half a million acres, is a lighter crop, and barley is grown on a considerably smaller scale. All told, these four cereals yield little more than half the weight of the potato crop, which amounts to 2m. tons, produced from less than half a million acres. Grapes are extensively grown, and a certain amount of maize; while a relatively small acreage of sugar-beet (some 65,000 acres) provides a crop of nearly half a million tons, from which over 50,000 tons of raw sugar are extracted.

These food crops are nothing like sufficient for the needs of the population, and in 1949 one-fourth of all the imports, including those obtained through E.R.P. (Economic Recovery Plan), consisted of foodstuffs—mostly wheat and other cereals, sugar, and edible oils and fats. The pastures, too, are somewhat sparsely populated. Cattle are the mainstay of the livestock industry, numbering over 2m. early in 1950, when also there were about a couple of million pigs; but sheep, goats, and horses, all told, were fewer than one million.

The Alpine provinces are predominantly engaged in forestry, together with the cultivation of rye and oats and the rearing of cattle, which is here carried on as in Switzerland. During and since the Second World War large areas of forest have been cleared, but over one-third of the whole country is still classed as forest and woodland, and forestry is an industry of prime importance. Upwards of 9m. cubic feet of timber were felled in 1949, and the exports of wood (mostly wood in the round or sawn for building), and of wood-pulp and papers, provided between a quarter and a third of the total value of the exports.

The chief minerals are lignite and anthracite, iron ore, lead, zinc, copper and magnesium ores, graphite, and salt. True coal is almost entirely wanting, and the anthracite mines provide only about 200,000 tons a year, but lignite abounds among the more recent Tertiary rocks in the east of the Alps, and especially in the Styrian valley of Kainach, which opens from the west into that of the Mur below Graz; there is an annual production of about 4m. tons. The chief iron-ore workings are in northern Styria, at Eisenerz (*Eisen*, iron; *Erz*, ore), on the north side of the Erzberg (Ore Moun-

tain), and at Vordernberg, on the south side of the mountain. Here the Erzberg is almost one entire mass of an iron carbonate, and the ore, which has been mined for 2,000 years, is obtained from open quarries. More valuable kinds of iron ore (limonite and siderite) are obtained from the Hüttenberg Erzberg, in the north-east of the neighbouring province of Carinthia. In 1950 the production of iron ore was nearly 2m. tons; of pig-iron, nearly 1m. tons; of raw steel, 1m. tons; and of rolled steel over half a million tons. Iron and steel in various simple forms—crude or in sheets, bars, etc.—account for between a fifth and a sixth of the value of all exports.

The working of iron and steel in all forms is chiefly carried on at two places, Steyr in Upper Austria, which is in direct railway communication, chiefly by way of the valley of the Enns, with Eisenerz; and Donawitz, close to Leoben, at the mouth of the valley leading from the Mur up to Vordernberg. Graz, in southern Styria, in a small extension of the Mur valley, and Klagenfurt, the nearest important town to the iron region of Carinthia, of which province it is the capital, both carry on iron works along with other industries.

Salt is abundant in the Salzkammergut, in the south-west of Upper Austria, at Hall in the northern Tirol (below Innsbruck), and at Hallein in Salzburg, above the town of Salzburg. Extensive deposits of china clay have been found half-way between Linz and Passau. Austrian graphite is noted for its fine quality, and is found in sufficient quantity to make Austria one of the chief sources of world supply. Before the Second World War, and up to 1944, production averaged 20,000 tons a year; then it almost stopped, but by 1951 the output had increased again to over 18,000 tons. In the Russian zone, around Zistersdorf, an oilfield which has had a somewhat chequered career (p. 269) was credited in 1951 with an output of 15m. barrels.

As well as the large export of crude iron and steel from native ores, there is a smaller export of tools, ball and roller bearings, and machinery; but machinery is imported to a greater value, while the imports of minerals and mineral oils (nearly all coal and coke) rank second only to the import of foodstuffs. Apart from ordinary fuels, Austria has large resources of water-power; but these have not yet been as fully developed as in Switzerland; in 1950 the output of electricity was under 5,000m. kwh.—less than half the Swiss total for the same year. Power is installed in many factories, and the textile industry in particular is of growing importance. Raw cotton and wool constitute well over half the textile imports, while on the other hand textile exports are mostly cotton and woollen fabrics, embroideries, and knitted goods.

Austria has some 3,750 miles of railway and 5,500 miles of road; 45,000 motor-cars, and nearly as many lorries. Since the

Second World War all the major industries—banking, mining, iron and steel, oil, electricity, transport, &c.—have been nationalised.

The one large city left to Austria at the division of the old monarchy was Vienna, the capital, which before the First World War had a population of over two millions. Standing at the base of and partly upon the foothills of the Alps at the east end of the narrow valley through which the Danube flows after leaving Germany, it is so situated as to cause all traffic between the Hungarian plains and southern Germany to converge on it, and the value of this position is enhanced by the comparatively easy routes to the Adriatic. Eighty miles by rail south-south-west of Vienna (56 miles by road) the oldest of the trans-Alpine railways, completed in 1854, passes at an elevation of less than 3,000 feet through a tunnel nearly a mile long under the Semmering Pass (3,215 feet), and continues to Bruck, whence one rail route leads on to Venice and another to Trieste. Since Vienna ceased to be the capital of a great empire the population has dropped to about 1½m., but the advantages of its position maintain it as a great commercial and industrial centre, with a reputation for manufactures of special character and high quality similar to those of Paris—fashionable clothing, fine furniture, musical instruments, luxury goods, and elegant fancy wares.

A highway of outstanding historic and commercial importance, linking Austria with Italy, runs from Innsbruck to Verona *via* the Brenner Pass (4,495 feet), on the frontier between the two countries. This route was used in prehistoric times in the trade in Etruscan bronzes and earthenware and Baltic amber, and was selected by the Romans for one of their trans-Alpine roads. A modern carriage road was made across it in 1772, and a railway, notable as actually crossing the pass, not tunnelling under it, was completed in 1867. Innsbruck is only 25 miles by railway north of the summit, and Verona 150 miles south of it. The three most populous towns in the former crown-land of Tirol—Innsbruck, Bolzano (Bozen), and Trento (Trent)—are all on this route.

TOWNS HAVING A POPULATION OF OVER 50,000 IN 1951 (CENSUS)

Vienna ¹	.	.	.	1,760,784	Salzburg	.	.	.	100,096
Graz	.	.	.	226,271	Innsbruck	.	.	.	94,599
Linz	.	.	.	185,177	Klagenfurt	.	.	.	62,792

¹ Constitutes a province of 469 square miles.

CZECHOSLOVAKIA

The Republic of Czechoslovakia was established in 1918 from the former crown-lands of Bohemia and Moravia, the greater part of Austrian Silesia, and the mountainous or hilly tract of northern Hungary. In 1938, as a result of the Munich Agreement, large areas were apportioned to Germany, Hungary, and Poland. In the following year German forces occupied Bohemia and Moravia, and Hungary moved into Carpathian Ruthenia, leaving the self-declared State of Slovakia alone in Central Europe. After the Second World War, the pre-1938 frontiers of Czechoslovakia were restored, except in respect of Carpathian Ruthenia, which was transferred to the Soviet Union. Within the restored frontiers, the People's Democratic Republic was declared in 1948. Nearly all industrial enterprise has been nationalised.

A long, narrow country, nowhere more than 180 miles wide, Czechoslovakia has, after all these changes, an area of close on 50,000 square miles—about the size of England—and a population of around 12½m. Much of the area is mountainous or hilly, but about 60 per cent. of the total, or nearly 30,000 square miles (19m. acres), is classed as agricultural. Nearly another third (32 per cent.) is covered with forests, which extend to 16,000 square miles (10m. acres); Czechoslovakia is richly as well as extensively wooded, and the timber industry is a valuable asset. The remaining 8 per cent. of the country (4,000 square miles) is accounted for by built-up areas, waste land, &c.

Of the agricultural land, nearly three-fourths (14m. acres) is arable, and over a fourth (5m. acres) consists of permanent meadows and pastures. Besides these 5m. acres of permanent pastures, nearly 3m. acres of the arable land are classed as temporary meadows and half a million acres are devoted to orchards and gardens, leaving about 10m. acres—an area equal to that under forests—for field crops. Before the Second World War, over 8m. acres of cropland were devoted to cereals. As a result of the war, the areas under wheat, rye, barley, and oats all declined, but in the early post-war years they still occupied 7m. acres, wheat being grown on about 2m. acres and each of the other three cereals on 1½–2m. acres. Normally the yield of wheat is about 25 bushels an acre, and the total wheat crop over a million tons; about a million tons of rye

are grown, while the crops of barley and oats average about three-quarters of a million tons. Much heavier crops of sugar-beet (between 4m. and 5m. tons) are grown on a much smaller area (under half a million acres), and the production of this crop is up to pre-war standard. Potatoes have not recovered so quickly; before the war their acreage approached that of the individual cereals, and crops of 10m. tons were raised; in the early post-war years they were yielding 6m. tons from 1½m. acres.

Cattle are the mainstay of the livestock industry. The 8m. acres of meadows and pastures, permanent and temporary, carry about 4m. cattle as against half a million sheep; there are about a million goats and 3m. to 4m. pigs. Half the cattle are cows, and the dairy industry is well developed. But Czechoslovakia is not self-supporting in food, whether derived from the animal or the vegetable kingdom. Prepared foodstuffs, principally beet-sugar and manufactured products such as cocoa and chocolate, provide about 5 per cent. of the exports by value; but over 20 per cent. of the imports (which almost exactly balance the exports in value) are primary foodstuffs—cereals, meat, butter, eggs, fish, etc.

The richest agricultural district is in the north-west, towards the north of the Czech plateau (Bohemia), drained by the Elbe and its left-bank tributary, the Eger. Here are grown not only cereals but sugar-beet, hops, the vine, tobacco, flax, and hemp. Sugar-beet is also largely cultivated in the valley of the Morava. In 1950, over 100 sugar factories produced nearly 900,000 tons of raw sugar.

The western part of the State is also the richest in minerals. The main deposits of coal lie to the west and south of Praha (Prague), those of lignite immediately to the south of the Erzgebirge (Ore Mountains). True coal is also mined in the Cieszyn (Tessin) district, adjoining Polish Silesia. Iron ore is found near Praha, but not in large quantities.

These regions have long been the principal seats of manufacturing industry. Plzen (Pilsen), south-west of Praha, is known far and wide for its beer (brewed from Czechoslovakian hops and barley), but has larger importance as the chief centre of heavy industry in Czechoslovakia. Originally it obtained iron ore from deposits to the south-east of the city; later ore was imported by river, and great armaments works grew up there (notably the Skoda works). Moravská-Ostrava, in north-east Moravia, is another heavy industrial centre, utilising Silesian coal and iron imported *via* the Oder. Cotton, woollen, jute, and other textile industries are likewise important, these manufactures flourishing chiefly at Liberec (Reichenberg; cottons) in northern Bohemia; at Brno (Brünn; woollens), at Jihlava (Iglau) in Moravia, and at Opava (Troppau) in Silesia, though Plzen and many smaller towns also carry on a variety of textile industries.

Glass-making, which was introduced into Bohemia from Venice in the sixteenth century, and for which Bohemia acquired and has long maintained a high reputation, especially as regards the treatment of crystal, is pursued chiefly at Eger (Cheb) and other places near to or belonging to the Bohemian Forest, where the geographical conditions have always been favourable. The forest supplies not merely fuel but potash, and since silicate rocks have come to be used in glass-making, this material also is obtained from the Bohemian Forest, while coal, as already indicated, is at no great distance. Jablonec, not far from Liberec, has long made a speciality of the manufacture of small articles of glass—buttons, beads, imitation jewellery, &c.—which find their way to the most distant parts of the world. Porcelain is made at (among other places) Karlovy Vary (Karlsbad), on the River Eger, where there are deposits of kaolin. The great Bata shoe factory, products from which were exported all over the world, prior to the establishment of branch factories in many other countries, is at Zlin, 40 miles east of Brno.

Czechoslovakia's mineral wealth and imports of raw materials for manufactures indicate its industrial and commercial activity. According to the latest available returns (1948), iron and other ores and unmanufactured metals, cotton and wool and other raw textiles, make up a quarter of the imports, while iron and steel and manufactures thereof, machinery and machine tools, locomotives and other vehicles, arms and ammunition, cotton, woollen and other piece goods, footwear and glassware, provide 60 per cent. of the exports. Russia has the biggest share of the trade—about one-sixth of both imports and exports.

Praha or Prague is the old capital of Bohemia, a region ringed round by mountains, within which a dense population has lived from a remote period. Nowadays Praha is also the capital of the republic. It occupies a situation characterised by physical features which combine to make it a commercial centre. It lies near the middle of Bohemia, on a large tributary of the Elbe, the Vltava (Moldau), at the head of navigation for boats of considerable size, about the place where the steeper ascent to the highlands of southern Bohemia begins, at the meeting-place of roads from gaps in the mountains on the east and west.

Brno (Brünn), the second largest town in Czechoslovakia and the chief town of Moravia, is also well situated commercially—a railway junction at the confluence of two rivers, with a nearby coal-field. The importance of woollens among its manufacturing industries has already been mentioned. Ostrava (Moravska-Ostrava), which ranks next in size, is on the Silesian (Polish) border and derives industrial importance from its coal-fields. Another town occupying an important commercial situation is Bratislava (Pressburg), on the Danube where that river begins to form part of the

Czechoslovakian frontier. It is a natural focus of European waterways, embracing canal connections with the Rhine, Elbe, Oder, and Vistula.

Up to the Second World War, a large German population was found throughout the country, except in Slovakia, amounting to roughly a third of the total. After the war, the German inhabitants were transferred to east and south Germany, their places being taken by Czechs from abroad or from the inner parts of the country.

TOWNS WITH POPULATIONS OF OVER 100,000 AT CENSUS OF 1947

Praha (Prague)	. . . 922,284	Bratislava (Pressburg)	. . . 172,664
Brno (Brünn)	. . . 273,127	Pízen (Pilsen)	. . . 117,814
Ostrava	. . . 180,960		

HUNGARY

Hungary's natural resources and the geographical conditions governing their development remain much the same as in the early part of the century, but the plans for utilising them have been revolutionised by the Second World War. The ancient kingdom, which nominally reverted to that character under a regency between the two World Wars, has given place to the Hungarian People's Republic, and by degrees all industries have been nationalised, only shops employing fewer than ten workers being left in private ownership. Large estates have been taken over and distributed among the peasants in small holdings, with the ultimate view of land development by collective agriculture. By 1950, some 3½m. acres of arable land (nearly a quarter of the total) had been distributed among individual holders, and 2½m. acres of forest land (more than four-fifths of the total) had been appropriated for public purposes. A Five-Year Plan which came into operation in 1950 aims at changing Hungary from a country whose economy has been primarily agricultural, into an industrialised country in which agriculture will play an important but subordinate part. Under an agreement with U.S.S.R. for economic co-operation between the two countries, several mixed companies have been established to develop minerals, oil and gas, shipping, and air transport. The British and United States Governments have more than once protested to the Hungarian Government against alleged violation of the fundamental freedoms laid down in the Peace Treaty.

With an area of 36,000 square miles and a population of 10m., Hungary is a little larger than Ireland and twice as densely populated. Over 90 per cent. of the population are Magyars; other elements, though comparatively small, are numerous. In 1946 a

mutual exchange of their Slovak and Magyar populations was arranged between Hungary and its northern neighbour, Czechoslovakia, and the transfer was carried out during the following three years. Many Germans were expelled.

Hungary comprises the extensive plains of the middle Danube and its tributary, the Tisza (Theiss). The Danube, coming from the west, forms part of the northern boundary and then, turning south, bisects the country. Its plains, known in Hungary as *Alföld* (lowland), constitute the *Puszta* or Hungarian steppe country, a description more applicable in the past than in recent years, when reclamation has transformed the character of large areas. Despite its rivers and its great lake, Balaton, in the west, Hungary is naturally a country of considerable aridity, ringed round by mountains which receive most of the rainfall, its surface broken by stretches of sandy desert and marshy wastes. Regulation of the rivers, particularly the Tisza, has helped to confine their waters to regular channels, and sandy tracts have been reclaimed by the planting of *Robinia pseud-acacia*, which has prepared the way for other vegetation and led to the establishment of forests and vineyards.

Nearly 80 per cent. of the entire country is classed as arable and pasture land (28,000 square miles; 18m. acres), and nearly 12 per cent. as forests and woodland (over 4,000 square miles), leaving barely 9 per cent. for built-on areas, waste land, etc. (over 3,000 square miles). Most of the farming country is arable (14m. acres), but orchards and gardens, temporary meadows and fallow land reduce the crop land to less than 12m. acres. The main crops are cereals. The dry climate and summer heat are well suited to the growth of maize and wheat, rich in gluten, from which fine flour is made. Before the war the area under wheat averaged nearly 4m. acres yielding 21 bushels to the acre and a total crop of over 2m. tons. Wheat-farming was slow in recovering from the effects of the war, but by 1950 the area under cultivation was well over 3½m. acres, yielding just about 2m. tons. Not only was wheat on the up-grade, but other crops were already above the pre-war level. Already in 1948 the maize crop, grown on 3·3m. acres, yielded 2·8m. tons (half-a-million tons more than pre-war); rye and barley each topped their pre-war average tonnage, while oats were close behind; potatoes, in 1949, produced 2m. tons from 700,000 acres, and the sugar-beet crop, with a yield of 1·8m. tons from 250,000 acres, more than doubled the pre-war acreage and nearly doubled the tonnage. The growing use of agricultural machinery and fertilisers during the present century has helped to increase production.

Among agricultural specialities are the wines derived from the vineyards occupying old volcanic soils in the north. The most celebrated are round the village of Mád, on the slopes of a hill to the north-west of Tokay, which gives its name to the wine; but

other highly esteemed Hungarian wines come from other volcanic soils farther west, clothing the slopes of the Matra, and from sheltered lands north of Lake Balaton. Among other products are fruit of many varieties and tobacco.

The recovery (or otherwise) of the livestock industry from the effects of the Second World War is shown by the following returns (some for 1948, others for 1949 or 1950), the comparable pre-war figures being given in brackets: cattle 2m. (1.9m.); horses 569,000 (939,000); sheep 579,000 (1.9m.); goats 115,000 (66,000); pigs 6.5m. (3.9m.). Permanent meadows and pastures form one-sixth of the whole country and account for nearly 4m. acres. Great attention was paid before the war to improving the breeds of livestock which flourish on the extensive grasslands. Horse and cattle-breeding establishments were founded, with horses of English and Arab breeds and cattle mainly of the Swiss Simmental breed, which is good for both meat and milk.

Other useful sources of food supply are the river and lake fisheries, which are practised on a commercial scale. They are particularly active in the Danube and Tisza rivers and in Lake Balaton.

The country is not highly mineralised, but some coal, mostly lignite (brown coal), is found within the angle of the Danube to the north-west of Budapest, and also near Pécs, in the south-west, as well as iron near Szeged, on the Tisza, opposite the confluence of the Maros. Bauxite deposits are being worked and supply an aluminium industry; the production of crude petroleum reached nearly 800,000 tons in 1951, and the production of natural gas was over 90m. cubic metres. There are oil refineries which serve both the home market and the export trade. Crude oil also is exported.

In the years before the Second World War, Hungary was self-supporting in foodstuffs, and had a large surplus of cereals, livestock, and other foods for export. In 1937 grain and cereals accounted for over one-fifth of the total export value. Imports, on the other hand, consisted largely of raw materials and manufactured products—timber, ores, fuels, textiles, chemicals, &c. Complete figures for post-war years are not available. Hungary is one of the countries for which it was not possible to include returns in the United Nations *Year Book of International Trade Statistics*, which revived in 1951 a pre-war publication of the League of Nations. In 1947 coal accounted for 15 per cent. of the import value, and cotton for 6½ per cent., while the principal export items were poultry (6½ per cent.) and cotton fabrics (6½ per cent.). In 1949 imports were drawn chiefly from U.S.S.R. (21.4 per cent.), the United Kingdom (13.2 per cent.), Czechoslovakia (10.3 per cent.), Austria (6.8 per cent.), Germany (6.4 per cent.), and Poland (5.3 per cent.). Exports were sent chiefly to U.S.S.R. (24.9 per cent.), Czechoslovakia (10.1

per cent.), Germany (9.2 per cent.), the United Kingdom (8.1 per cent.), Austria (7 per cent.), and Rumania (5.6 per cent.).

Budapest, the capital, is situated on both banks of the Danube in a position strengthened by the spurs of the last hills skirted by the river before it enters the Hungarian plains. It is the only city in the republic comparable with those of other European countries. The other towns, such as Szeged, Kecskemet, Debrecen, and Miskolc, are more like large agglomerations of villages, spread over areas of up to hundreds of square miles. There are about a dozen such towns with a population of over 50,000. Those with estimated populations of over 100,000 in 1949 were:

Budapest, 1,058,300

Szeged, 132,600

Debrecen, 119,600

YUGOSLAVIA

The Federal People's Republic of Yugoslavia came into existence in 1945, a few months after the close of the Second World War, and replaced the monarchy which had existed since the establishment of the State in 1918. It was a federation of six republics—Serbia (with the autonomous territories of Vojvodina and Kosovo-Metochia), Croatia, Slovenia, Bosnia and Herzegovina, Macedonia, and Montenegro. To these were added, by cession from Italy in the 1947 Peace Treaty (map p. 478), most of the Italian province of Venezia Giulia (the province comprising the Italian territories in the north-east corner of the Adriatic) and Zara. In the absence of agreement about Trieste, the Peace Treaty constituted a 'Free Territory' of 285 square miles around the port, and in the continued absence of agreement for its administration this Free Territory is divided into two zones; a Northern Zone of 86 square miles (pop. 300,000, mostly Italian) including Trieste, under British and U.S. military control till 1953, when it was proposed to hand it back to Italy, and a Southern Zone of 199 square miles (pop. 100,000, mostly Slovene), virtually incorporated in Yugoslavia.

The foundation of the Federal Republic was laid during the war by the National Liberation Committee of Yugoslavia, originally groups of partisans who acquired increasing power as the country emerged from war. Widespread changes since that date include the redistribution of large estates among small landowners, the maximum holding being 90 acres; State control of foreign trade, nationalisation of banking facilities, a complete overhaul of the judicial system, and a Five-Year Plan for the development of the national economy.

With an area of close on 100,000 square miles and a population of 17m., Yugoslavia is a little larger than the United Kingdom

and supports about a third as many people. The Federation embraces kindred but not homogeneous races, and three languages are officially recognised—Serbo-Croat (which is generally spoken), Slovene, and Macedonian. Printing adds to the differences. In Serb and Macedonian, books and newspapers appear in Cyrillic characters slightly different from Russian and Bulgarian, while Croat and Slovene are restricted to Latin characters.

In the north-west and west, Yugoslavia is mainly mountainous; the north-west is traversed by the south-eastern ranges of the Alpine system, with an east-west trend; the west by the ranges of the Dinaric Alps, which trend from the north-west to the south-east. The chains of the Dinaric Alps are composed of limestones, including in places steep and rugged dolomitic summits; to the west, younger limestones form the region known as the Karst or Carso, an area presenting large expanses of naked grey rock with patches of soil of varying depth, generally thin, only in isolated hollows. In spite of the heavy rainfall, the Karst region is without surface water, except where it emerges in springs from the base of characteristically fissured cliffs. These features extend into western Bosnia (central Yugoslavia), but the north-east of that province is composed of a gently undulating, fruitful, densely peopled hill country, sinking gradually to level plains traversed by the Danube and some of its large tributaries. The south-east of the country is mountainous, but with fertile valleys and basins.

More than half the country (53,000 square miles; an area larger than England) is classed as arable and pasture land; another third (33,500 square miles; an area larger than Scotland) is covered with forests; and the remainder (12,500 square miles; one and a half times the size of Wales) is made up of built-on areas, waste land, &c. The arable land (30,500 square miles: nearly 20m. acres) is mostly devoted to cereals; wheat, (4½m. acres) and maize (6m. acres) alone account for more than half of it. Wheat, yielding in a good year an average of 21 bushels per acre, produces a crop of 2½m. tons, while maize, to which the climate is better suited, has a crop of 4m. tons. Rye, barley, and oats are grown on a much smaller scale, each occupying between half a million and a million acres and producing between a quarter of a million and half a million tons. Potatoes, grown on over half a million acres, produce a crop of 2m. tons—considerably more than before the war. In general, production is up to pre-war standard and often beyond it; there have been notable developments in several important though secondary crops. The area under sugar-beet has more than trebled, and the crop, which averaged half a million tons in pre-war years, is well over a million tons. Hemp, which was grown both for fibre and seed on 120,000 acres, is now grown on over a quarter of a million acres for fibre alone and on 45,000 acres for seed alone,

producing 8,000 tons of seed and 70,000 tons of fibre. Sunflowers, which were grown for seed on 20,000 acres, are now cultivated on 320,000 acres, and the crop has increased more than ten-fold, to nearly 150,000 tons. Cotton has jumped from 5,000 acres to 100,000 acres, yielding 9,000 tons of cottonseed and 5,000 tons of ginned cotton. Tobacco has more than doubled both in area and in weight of crop, and at the half-century occupied 85,000 acres yielding 30,000 tons. Olives have extended to over 100,000 acres, and 7,000 tons of olive oil were crushed from the crop in 1949. Fruit trees, particularly plums, abound, especially in Serbia, and the vine is largely cultivated on slopes with a favourable exposure, chiefly in the north-east, on both sides of the Danube. Grapes, indeed, must be reckoned among the major crops of Yugoslavia; they are grown on well over half a million acres, and production approaches a million tons.

The outstanding agricultural area is the north-east corner of the country, the Vojvodina, comprising the loess-covered plains north of the Danube; in summer they present an almost unbroken expanse of maize and wheat. West of the Danube the surface, while still offering much arable land, rises towards Zagreb, and still farther west (in Slovenia) the arable land is found only in isolated basins, the most important of which is that of Ljubljana, about 25 miles long by 6 miles wide, and everywhere over 900 feet above sea-level.

Cattle are largely reared in the Alpine districts, horses chiefly in the Vojvodina, and pigs in all the most populous parts of the State. Sheep and goats are most numerous in the Karst, where goats are often a pest through their habit of devouring the tops of growing trees. Sheep are nearly as many as all other major livestock together. Compared with the pre-war number (1.9m.), goats were down by well over a million in 1951, but for the most part, livestock at the end of the half-century had more than made good the war-time losses. Numbers in 1951, followed by the 1939 figures in brackets, were: Sheep, 10.3m. (10.3m.); cattle, 4.7m. (4.3m.); pigs, 3.9m. (3.6m.); horses, 1.09m. (1.3m.). An unusual feature of the livestock returns, for a European country, is an entry for buffaloes, which numbered 40,000 before the war, but have since increased to 60–70,000.

Forests are most extensive in the Alps of Slovenia and in Bosnia. Dalmatia, the maritime tract of the country, has all the products of a Mediterranean region, with laurel thickets, groves of pines and cypresses, besides olives, figs, oranges, and citrons.

Among minerals the most important are coal (output 1.1m. tons in 1950) and lignite (12m. tons), which are found in various places; iron ore (800,000 tons), mined in Bosnia; copper ore (1.1m. tons), worked in Serbia. Other products include lead and zinc ore (1m. tons), to the south of Belgrade and north-west of Ljubljana; salt

(130,000 tons), in the north-east of Bosnia; and bauxite (200,000 tons), in Dalmatia. Manganese, antimony, and pyrites are also worked. The principal coal-mines lie between Ljubljana and Zagreb, and furnish fuel for blast furnaces in the Ljubljana basin.

Industrial development is mostly confined to north-west Yugoslavia, and to Bosnia, where much of the mineral wealth is concentrated. North-eastern Yugoslavia, the principal agricultural area, has industries associated with its products—sugar refining, flour milling, &c.

Exports consist largely of agricultural goods and timber, while the import of manufactured articles is high.

In spite of the long Adriatic coastline, access to the sea from central Yugoslavia is difficult. The only railways across the Dinaric Alps are the line from Sarajevo to Dubrovnik (Ragusa) and Kotor; that from Zagreb to Split, which divides into two arms across the mountains; and that from Ljubljana to the disputed port of Trieste. A certain amount of traffic is carried by the Danube.

Beograd (Belgrade), capital of Serbia and of the Federation, is centrally placed on the Danube at the confluence of the Save. Zagreb, capital of Croatia, is a centre of banking and commerce, with a number of food industries. Other large capital cities are Ljubljana (Slovenia), Sarajevo (Bosnia and Herzegovina), Skoplje (Macedonia), and Novi Sad (Vojvodina). Cetinje, the little capital of Montenegro, has been renamed Titograd (12,000).

TOWNS WITH POPULATIONS OF OVER 70,000 IN 1948

Belgrade	388,246	Subotica (in Vojvodina)	112,551
Zagreb	290,417	Skoplje (Skopie)	91,557
Ljubljana	120,944	Novi Sad	77,127
Sarajevo	118,158	Rijeka (Fiume, with Susak)	72,120

ROUMANIA

The frontiers of Roumania have undergone many changes during the present century. Established as a monarchy during the nineteenth century from the principalities of Wallachia and Moldavia, with the Dobruja added later, it was considerably enlarged at the end of the First World War by the addition of Bessarabia from Russia, the Bukovina from Austria, and Transylvania and other territories from Hungary. In 1940 the Soviet Union claimed Bessarabia and Northern Bukovina, an area of 19,500 square miles, supporting a population of 3½m. In the same year, Southern Dobruja (3,000 square miles) passed to Bulgaria, and 17,500 square miles of Transylvania to Hungary. As a result of the Second World

War, Roumania recovered the territory yielded to Hungary, but not the territories yielded to Russia and Bulgaria. As fixed by the Peace Treaty of 1947, the frontiers enclose an area of over 91,000 square miles (roughly equal to that of Great Britain), with a population of about 16m. As regards both area and population, Roumania approximates in size to its neighbour, Yugoslavia.

In 1947 the monarchy was overthrown and the People's Republic of Roumania proclaimed. Since then many of the resources of the country—landed estates, manufacturing industries, mining, banking, insurance, transport, tele-communications—have been nationalised and placed under the direction of 'Sovroms:' Soviet-Roumanian companies with Soviet managing directors.

Physically the country is divided by a great arc of mountains. An arm of the Carpathians, coming from the north and striking south-south-east, links on to the Transylvanian Alps, which swing round to the west. These Alps, rising to over 8,000 feet, are composed mainly of ancient crystalline rocks with steep forest-clad slopes, while the Carpathians are of softer rocks, largely denuded of forest and usually lower in elevation. Stalin (formerly Brasov) stands almost in the angle of the two arms. Within the arc is the Transylvanian Basin, hilly, and in parts over 3,000 feet high, but with many broad valleys and cultivated plains between the forested and vineyard-covered slopes. Around this core of high land, Roumania is composed mainly of plains, draining to the Danube, which forms most of the country's southern frontier, and to its left-bank tributaries, the Tisza and the Siret. The climate is subject to extremes of heat and cold, with liability to summer droughts, making the crop yields rather variable.

More than half the country (49,000 square miles) is classed as arable and pasture land, and more than a quarter (25,500 square miles) is covered with forests, but there remain 17,000 square miles (nearly a fifth of the total) which are unproductive—built-on areas, waste land, &c. The arable land (36,000 square miles; 23m. acres) is mostly under wheat (6m. acres) and maize (10m. acres), which yield respectively crops of 2½m. and 5m. tons. They are grown chiefly on the plains of Moldavia and Wallachia, in the east and south of Roumania, and are the standard foodstuffs of the country. In the past, Roumania has been the chief maize-exporting country in Europe. At the present day, statistics are hard to come by. The foregoing figures are based on the 1950 *Year Book of the United Nations Food and Agriculture Organisation*. They have been adjusted to the post-war boundaries of Roumania and are useful not only as indicating the two dominating factors in Roumanian agriculture, but as showing little change from the pre-war position. They relate, however, like most of the statistics of Roumanian crop returns, only to the first two or three years after the war, when both

the area and the production of other crops were in many cases much below the pre-war standard. Later years may have seen a recovery comparable with that of other countries, but evidence is lacking. One or two general indications may be noted. After maize and wheat, oats and barley are the most extensively grown crops, and then come dry beans, grapes, and potatoes, the last being easily the most weighty of the secondary crops, though in 1949 (for which statistics are exceptionally available) production dropped to a million tons—only half the pre-war average. Sugar-beet has been on the increase, and so have cotton and tobacco. If the development of the early post-war years has been maintained, sugar-beets may now be producing a million tons a year in Moldavia and Wallachia.

The pastoral lands of Roumania extend to over 13,000 square miles (8½m. acres) and form one-seventh of the whole country. The Dobruja, to the east of the lower reaches of the Danube, where that river swings round to the north before emptying its waters into the Black Sea, is a relatively infertile region, and is given over largely to sheep-rearing. The livestock figures, like the crop returns, are much in arrears. Sheep, cattle, pigs, and horses—in descending order—are the most numerous. The following are the latest available figures (1946–47 or 1947–48) but they are of little value except as a partial indication of war losses. The normal numbers (1939) are given in brackets. Sheep, 7·3m. (9·8m.); cattle, 3m. (3·5m.); pigs, 1·4m. (2·3m.); horses, 0·9m. (2m.).

Forests are widely distributed along the mountain arc which divides the country, and contain much oak, beech, and spruce.

Paramount among the country's mineral resources is petroleum, worked along the face of the Carpathians. The output of crude oil in 1951 was 4·2m. tons, a big drop from the peak production of 8·7m. tons in 1936; but it is now claimed to be over 9m. tons. Production has been affected by—among other factors—the damage which the wells sustained during the war. Associated with the petroleum is a large production of natural gas. In the past, petroleum has been the chief export, accounting for about half the total value in most years. Details for recent years are not available; it was not possible to include Roumania in the *Year Book of International Trade Statistics*, revived by the United Nations in 1951. Coal and iron ore occur in the Transylvanian Alps, where copper, lead, zinc, and bauxite are also worked. Coal production in 1951 was 3·8m. tons. Steel is credited with 750,000 tons. Salt mines extend over an area of 250 square miles in the lower Carpathians, and the industry has been a State monopoly since 1863. There are gold and silver mines in the hills of the Transylvanian Basin.

For manufactured products Roumania still relies largely on imports, but many industries are being developed under Soviet

direction. These include production of printed cotton fabrics, flour-milling and other agricultural processes, and wood-working.

The Danube constitutes an important line of communication from the sea along the southern borders of Roumania and the northern borders of Bulgaria, and upwards into Yugoslavia, Hungary, Czechoslovakia, Austria, and southern Germany. Owing to its international importance, navigation on the river has for nearly a century been regulated by a Commission of European Powers, which between the two World Wars sponsored extensive improvements to the river channel. The passage at the Iron Gate, a series of gorges sixty miles long, where the river breaks through the western end of the Transylvanian Alps, was straightened and deepened by blasting, and on the lower Danube the 100-mile channel from Braila down to the coast at Sulina, the only distributary sufficiently free from sediment to be navigable, was shortened and given a minimum depth of 24 feet, the same depth attaining over the Sulina Bar. The Second World War brought a disputed situation. Previously the United Kingdom and France, with Roumania, had played a prominent part in the Commission. At a conference in 1948 the Soviet representative introduced a convention restricting the rights of navigation and excluding the Western Powers from the Commission. This was approved by a majority, composed of Eastern European States, and traffic has since dwindled greatly.

The principal Danube ports are Galati (Galatz; 85 miles from the sea) and Braila 13 miles farther upstream. Originally rival ports—one stands in Moldavia, the other in Wallachia—they now share the Black Sea traffic with Constanta, on the Roumanian coast south of the mouths of the Danube. Constanta has several advantages over the other two, being continually ice-free, whereas the Danube freezes for some 40 days in the year. Transport inland from Constanta by-passes the lowest stretches of the river, and gives a shorter route to Bucharest, with which it is connected by the only railway across the Dobruja.

Bucharest, capital of the republic, stands back from the Danube, whose banks in that area are marshy; it is a railway centre with a variety of industries and manufactures.

TOWNS WITH OVER 50,000 PEOPLE IN 1945 WERE

Bucharest (Bucuresti)	984,619	Oradia	92,943
Cluj	110,956	Stalin (Brasov).	85,192
Iasi	108,987	Arad	82,882
Timisoara	108,296	Constanta	79,716
Ploesti	105,114	Craiova	74,786
Braila	97,293	Sibiu	63,736
Galati	93,229	Satu Mare	52,006

NORWAY

Norway and Sweden, which were under one king from 1814 to 1905, are now two separate kingdoms occupying the Scandinavian peninsula. Norway, the smaller of the two, comprises the western part of the peninsula—a stretch of country 1,100 miles long and nowhere more than 250 miles wide. With an area of 125,000 square miles, roughly equal to that of the British Isles, it supports a population of under 3½m. Fjords and lakes account for nearly 6,000 square miles of the total.

The greater part of Scandinavia is made up of a high tableland furrowed by deep and narrow valleys, the highest parts lying towards the western side, particularly in the south-west of the peninsula (that is, Southern Norway), where the Jotunheim attains over 8,000 feet. This high plateau reaches the west coast, and is there cut into by the remarkably deep, steep-sided inlets of the sea known as fjords, which give Norway its characteristic coastal scenery. Only at the heads of these fjords, and in a few of the deep inland valleys, notably those behind Oslo Fjord, is there any cultivable land. The high plateau top presents a desolate aspect, almost the only vegetation being that of a tundra, with heaths, mosses, and lichens. Even the latitudinal advantage of south Norway over the north is effectively cancelled out by the higher elevation. Below the barren plateau top and above the level of the forests are broad stretches of grassland, used as summer pasturage for the cattle kept in the valleys below.

Nearly three-fourths (92,000 square miles; all but 74 per cent.) of the whole country is classed as either waste or built-on. Nearly another quarter (29,000 square miles; 23 per cent.) is covered with forest. Only just over 3 per cent. (4,000 square miles) is available for farming. Nominally 3,100 square miles rank as arable land and only 900 square miles as permanent meadows and pastures; but the greater part of the arable land consists of temporary meadows (over 2,000 square miles), so that altogether there are some 3,000 square miles (2m. acres) of meadow land, as against little more than 1,000 square miles (640,000 acres) for food crops, including orchards, market gardens, and fallow. Oats are the most widely grown cereal, covering nearly 200,000 acres and yielding from 160–180,000

tons. Next comes barley, with an acreage and crop little more than half as large, while wheat ranks lower still, with a crop of about 70,000 tons, though the average yield is good—about 32 bushels to the acre from some 80,000 acres. Rye, always a comparatively trifling crop, has dropped to less than 3,000 acres with a production of 2,000 tons. Larger than any of these is the potato crop, producing 1–1½m. tons from about 150,000 acres. Largest of all is the meadowland crop of hay, amounting in 1950 to nearly 3½m. tons from 1½m. acres.

Livestock records have varied considerably since the Second World War, when Norway was occupied by the Germans. Sheep and cattle are the mainstay of the pastoral industry. In 1950 there were well over 1½m. sheep, or rather more than in 1939; while cattle, though still short of the pre-war figure, numbered nearly 1½m. Horses, which numbered over 200,000 in 1939, at first increased after the war, but then they began to get fewer and at the turn of the half-century were well under 200,000. Goats also, which numbered a quarter of a million before the war, were only just over half that number in 1950. On the other hand, pigs increased from well under to well over 400,000.

The forests of Norway are one of the country's greatest sources of wealth, providing about one-fourth of the exports measured by value. Something like three-fourths of the forested area is under pine and fir, valued as timber on account of its hardness and durability, qualities which are due to the closeness of the annual rings in consequence of the short summers. Little is exported nowadays as timber, but vast amounts are consumed in the production of wood-pulp and newsprint, the forms in which Norway's forest products are mostly exported.

The rivers of Norway are too rapid and broken to be of much use for navigation. Most of them are short; the longest is the Glommen (350 miles), entering Oslo Fjord, and there are about half a dozen others between 100 and 200 miles long. Some of the larger valleys are used by railways linking the east and west sides of the peninsula, the most southerly being a line from Oslo to Bergen over the Hardangerfjeld, and the most northerly a line from Narvik, on the Ofoten Fjord, to the Swedish iron-ore port of Lulea, near the head of the Baltic. The main function of the latter route is to carry ore from the Swedish mines to the sea during the winter months, when the Baltic ports are frozen up. The total railway mileage for the country is only 2,790 miles.

To a country with no coal or oil resources, the rapid rivers and lofty waterfalls are of enormous value as a source of industrial power; it has been estimated that waterfalls over 900 feet high account for some 60 per cent. of the possibilities. At the beginning of 1950, hydro-electric power was being developed to the extent of

1·86m. kw., and this was only about one-fifth of the potentialities. The total production of electricity in 1950 (all but a fraction of 1 per cent. of it hydro-electric) was 17,675m. kwh. The largest consumers are the electro-chemical and electro-metallurgical industries, engaged in electrical smelting (particularly of imported aluminium ores), the manufacture of calcium carbide and, latterly, of ferro-silicon, and the production of nitrates from liquid nitrogen. Other large consumers are the pulp and paper industries. Electrification of the railways is going forward, and 84 per cent. of all Norwegian homes have electricity.

The country's mineral wealth is not impressive in extent or amount. Chief of the ores mined are iron ore and pyrites, of which the combined production in 1951 was 1m. tons, only a third of the total being iron ore and titaniferous concentrates. The largest iron-ore mines—at Kirkenes, on the Arctic coast of Norway, near the Russian frontier—were destroyed during the war but were reconstructed with a view to resuming production in 1952 at the rate of 500,000 tons a year, to be increased later to a million tons a year. Low-grade ores are found at the head of Ranen Fjord, by Ofoten Fjord, and at other places in the far north within the Arctic Circle. Deposits of copper are mined at Roros, in the Glommen valley (yielding 22,000 tons of copper concentrates in 1951), and concentrates of zinc and lead, silver, and molybdenum are produced in smaller quantities. Granite and other stones are quarried for export.

One of the leading industries is fishing. From the sheltered fjords and islands boats set out in the spring for cod-fishing off the north coast and the Lofoten Islands. The chief cod-fishing ports are Tromsø and Hammerfest, situated in the extreme north, but with harbours kept open all the year round by the warm waters of the Gulf Stream Drift from across the Atlantic. Centres of the herring fisheries are further south—Bergen, Trondheim, and Stavanger. The drying, salting, and preparation of the fish is a major occupation in many of the ports, and the products comprise an important export. Brisling are caught off the southern shores and canned at Bergen and Stavanger. Altogether over a million tons of fish are landed annually, with a sale value at the fishing centres of £15–16m. Norwegian whalers play a leading part in whaling in the Antarctic, some of the factory ships being equipped to carry out the whole process of oil extraction and the preparation of bone meal and fertilisers from the refuse. The annual production of whale oil is over a million barrels valued at about £15m.

Measures for modernising the northern fisheries, with considerable economy of labour, are in progress, and as a result various projects for the industrial development of northern Norway, offering new outlets for labour, have been foreshadowed. Among these

projects are big iron works at Mo-i-Rana, a textile factory near Narvik, and a nitrate plant at Glomfjord for increased production of fertilisers. Already in 1949 Norway's industrial establishments, excluding electrical stations and the building trade, numbered over 6,000 and employed nearly a quarter of a million people, turning out goods valued at £366m.

Nearly all Norway's important towns are ports. Oslo, the capital, lies at the head of the Oslo Fjord, at a natural focus of routes over the plateau top. Bergen and Trondheim both possess fine sheltered harbours, and are centres of the fishing industry. Trondheim was formerly the country's capital, and the kings of Norway are still crowned there. In 1949 Oslo had an estimated population of 429,000. Only three other towns have populations of over 50,000, namely, as returned at the 1946 census:

Bergen, 110,424	Trondheim, 57,128	Stavanger, 50,320
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No other town numbered as many as 30,000 inhabitants.

Outlying Territories

Svalbard is Norway's name for her Arctic dependency, comprising Bear Island (70 square miles), 215 miles north of Norway, and the Spitsbergen archipelago (24,000 square miles; over three-fourths the size of Scotland), extending from the South Cape of West Spitsbergen or Mainland (north of the 76th parallel; 350 miles from Norway) to beyond the 80th parallel. Though the climate is modified by the Gulf Stream and the south-west coasts can be approached from the sea throughout the year, the islands are covered with glaciers and snow and agriculturally the whole area is classed as waste. In past centuries a centre for whaling, the archipelago owes its present economic value to the discovery and mining of coal since early in the twentieth century. The islands were assigned to Norway by the League of Nations in 1920 and occupied by the Norwegians in 1925. During the Second World War the mines were dismantled by the Allies and the mining camps evacuated, but they were reoccupied after the war.

There are six permanent mining establishments, three Norwegian and three Russian. The coal includes both steam coal and house coal. The number of Norwegian workers is about a thousand, and about half a million tons of coal are exported annually. Other minerals known to exist are magnetite and other iron ores, copper, lead, bituminous shales, and coloured marbles; but no widespread working of these has yet been developed. Seals, foxes, and polar bears are hunted.

Jan Mayen Island, about 300 miles north of Iceland, has an area of 144 square miles and rises to over 8,000 feet. Norway set up a meteorological station in 1921 and annexed the island in 1929. It is visited from time to time by fishermen, whalers, and seal hunters.

SWEDEN

The kingdom of Sweden covers the eastern and larger part of the Scandinavian peninsula, which it shares with Norway. It has an area of 173,000 square miles, of which the great lakes in the south—Vänern, Vättern, Mälaren, &c.—and other inland waterways account for 15,000 square miles. The country, though rising to over 6,000 feet in places, is generally less rugged and broken than the Norwegian landscape. From the crests near the frontier, the slopes towards the Baltic Sea are long and gradual, terminating in broad coastal plains crossed by many swift-flowing parallel rivers; the fjord type of coastline, so typical of the Norwegian shores of the peninsula, is completely lacking in Sweden.

In the southern part of the country the mountains give way to low-lying fertile land, where the great manufacturing regions and the country's best farming land are found. Agricultural conditions are at their best in Scania, the extreme southern peninsula of Sweden, where soils and general economy are very similar to those of Denmark. On this comparatively small area, which is the most densely peopled part of the country, grain and sugar-beet are grown and herds of dairy cattle, pigs, and poultry are kept.

Though nearly twice the size of Great Britain, Sweden supports only some 7m. people—one-seventh of Britain's population. Wasteland, built-on areas, &c., account for three-eighths (65,000 square miles) of the whole country, and more than half (90,000 square miles) is under forests—one of the main sources of wealth in the country, but not conducive to dense population. There remains less than one-eighth (actually just over 10 per cent.—18,000 square miles, or 11½m. acres) of the whole surface which is productive land agriculturally. This is officially divided into arable (9¼m. acres) and permanent meadows and pastures (2¼m. acres); but nearly half the arable (4m. acres) consists of temporary meadows, and with the permanent meadows and pastures these make up more than half the land available for farming. Livestock are less numerous than might be expected, especially as Sweden was not devastated in the Second World War. Cattle, the mainstay of the industry, number rather more than 2¼m.—about the same as in the Netherlands, and fewer than in Denmark, both with far less pastoral country. Sheep are round about 300,000—one-sixth as many as in Norway. There are

1½m. pigs, and under half a million horses. Great crops of hay are harvested. Half the area of meadowland (over 3m. acres) is devoted to this use, and the annual crop is over 4½m. tons.

Of the arable land on which food crops are grown (4½m. acres), cereals occupy over two-thirds. Oats tops the list, with crops of around 800,000 tons from 1½m. acres. Wheat produces nearly as heavy a crop (approaching ¾m. tons) from round about 800,000 acres. Rye (¼m. tons) and barley (200,000 tons) are smaller crops; but Sweden is one of the few countries in the world growing mixed grain on a large scale, and both the acreage and crop for this cultivation are little behind the figures for wheat. Heavier crops than any but hay are sugar-beet, potatoes, and fodder roots, each within sight of 2m. tons a year, though sugar-beet and fodder roots each occupy less than 150,000 acres, and potatoes less than 350,000 acres.

Fisheries are only a minor industry. Since the herring migrated from the Baltic, the catch has declined greatly, the chief fishing grounds being now on the other side of Sweden, off the coasts north of Göteborg. In 1948 the catch in these waters was valued at barely £5m.

Mining has always been one of the leading industries. Sweden has valuable mineral resources, notably of iron ore. Deposits of these ores occur in two localities, in the far north (Swedish Lapland), and to the north-west of Stockholm. The northern deposits are mined at the centres of Gällivara and, about 60 miles farther north, Kiruna, Luossavara and Tuolluvara; they are some of the most important and most easily worked deposits of iron ore in Europe. They all contain a high percentage of iron, mostly over 60 per cent., in some cases 68 or 69 per cent.; but while some contain as little as 0.05 per cent. phosphorus, the phosphorus content is generally high—from 0.6 to 3.5 per cent. During the summer months these ores are exported from the Swedish port of Luleå at the head of the Gulf of Bothnia, but in winter, when this outlet is frozen up, the ores are carried by one of the most northerly railways in the world to the Norwegian port of Narvik, which is open all the year round.

Phosphoric iron ores are also produced in great quantities in south-central Sweden, south of the Vester (West) Dal river, where Grängesberg, about 140 miles north-west of Stockholm, is the centre of a district containing more than 500 mines. The historic seat of the mineral industries of Sweden is farther east, on both sides of the lower Dal, which flows into the southern end of the Gulf of Bothnia near Gävle. To the south-east of Gävle, about 70 miles north of Stockholm, are the well-known magnetic mines of Dannemora. In this district there is an abundance of iron ore low in phosphorus content, and suited for the manufacture of first-class steel. In 1951, iron ore mined in Sweden totalled 15.1m. tons; of

this 14.7m. tons was exported in the crude state, while close on 900,000 tons of pig iron was produced within the country.

Coal production is on a small scale: less than half a million tons a year. Other minerals in active production include copper (mined since medieval times around Falun, 20 miles east of the confluence of the East and West Dal); and silver and lead ores (near the university centre of Uppsala, between Gävle and Stockholm). Zinc, manganese, arsenic, gold, and sulphur pyrites (400,000 tons in 1951) are also worked. Large quantities of paving stone are produced from Swedish quarries.

The production of electricity from water-power is of prime importance to Swedish industrial development, there being no oil and very little coal in the country. In 1950 the production was over 17,000m. kwh., nearly equalling Norway's; and in 1951 Sweden took the lead with over 18,000m. kwh., in addition to over 1,000m. kwh. from other sources, making a total of 19,500m. kwh. Of this production, 70 per cent. is utilised by industry, 10 per cent. by the railways, 15 per cent. by towns and settlements and the rest by country districts. Production of current is mounting steadily year by year as industries grow and spread; for example, a growing proportion of Swedish pig-iron is produced by electrical smelting of Swedish Lapland ore, a process which before the Second World War was largely based on imported coal from the United Kingdom.

Based on this iron smelting and associated metallurgical processes, Sweden has developed industries producing machinery of a highly specialised nature. Some of these products are the result, directly or indirectly, of Swedish inventions such as cream separators, ball bearings, and lighthouse lanterns. Various types of electrical machinery are also produced. A porcelain and glass industry turns out products of high reputation.

Sweden's great timber resources have given rise to industries which have taken on a big development with the growing availability of electric power. Sawn and planed timber, wood-pulp, newsprint and other forms of paper, and minor products, including matches, not only supply the home market but provide between 40 and 50 per cent. of the value of all Sweden's exports; in 1950 the f.o.b. figures for these exports of forest origin amounted to £170m., or more than £24 per head of the population.

In 1948 Sweden had over 17,000 industrial establishments employing 670,000 persons. In the most important industries, some 12,000 establishments employing nearly half a million persons turned out goods to the value of over £1,000m.

The manufacturing towns of Sweden are situated in the southern part of the country, particularly in the trough containing lakes Vänern, Vättern, or Mälaren, and the many associated smaller lakes. The Göta Canal, which utilises these lakes in its east-west

traverse of Sweden, offers a fine waterway across the country, by-passing the long journey round the southern tip of the country. Its total length, from Göteborg (Gothenburg) on the Skaggerak to Stockholm on the Baltic, is 347 miles, of which only 56 miles is actually canal. Its usefulness is, however, partly hampered by 65 locks. Göteborg, at the mouth of the Göta river, is the principal port of Sweden; it is open to ocean-going shipping and has therefore taken the commercial lead over Stockholm, the capital, which is hampered by ice in winter. Norrköping, on the Baltic coast, has textile industries, notably woollens. Jonköping, at the southern extremity of Lake Vättern, is the centre of the Swedish match industry. Eskilstuna, behind Stockholm, has hardware and cutlery industries that have earned it comparison with Sheffield. Further south, facing Copenhagen across the Sound, is the port of Malmö, which handles much of the local dairy produce. Other leading ports include Gävle on the Baltic, Hälsingborg, and Halmstad.

It is estimated that over 3m. people, or nearly half the total population, live in towns. Habitation of the country districts ranges from the thickly peopled farmlands of Scania to the sparsely settled northern regions, with their brief summers and long cold winters. The Lapp races established in these northern regions live mainly by fishing and by their herds of reindeer, which supply them with meat, milk, and skins for clothing. Dairy farming is a growing occupation among the more settled groups.

TOWNS WITH POPULATIONS OF OVER 50,000 IN 1950

Stockholm	733,615	Uppsala	61,539
Göteborg	349,145	Vasteras	57,829
Malmö	189,232	Boras	57,043
Norrköping	84,035	Linköping	53,232
Hälsingborg	71,151	Eskilstuna	52,742
Orebro	65,690		

DENMARK

Denmark is a kingdom comprising primarily the greater part (northern two-thirds) of the peninsula of Jutland, thrusting from the north coast of Germany towards Norway and Sweden, together with some 500 islands lying between Jutland and the west coast of Sweden. The islands have an area of over 5,000 square miles and Danish Jutland (in which northern Slesvig was reincorporated after the First World War) contains over 11,000 square miles, so that Denmark as a whole (16,575 square miles) is about half the size of Ireland. It is twice as densely populated, the two countries having much the same population (about 4½m.).

Though only about a hundred of the islands are inhabited, they carry a larger population than the mainland territory, and, commercially, the sea is less of a dividing factor than might be thought. Comparatively narrow channels separate the two largest islands, Zealand (*Sjælland*) and Funen (*Fyn*), from one another and from the mainland on either side. A road and rail bridge under two miles long connects Jutland with Funen. The Great Belt between Funen and Zealand, nine miles wide at its narrowest, is crossed by train ferry. Two train ferries connect the east coast of Zealand with Sweden across the Sound, one from Copenhagen to Malmö (16 miles), the other from Helsingør (Elsinore) to Helsingborg, where the Sound is only about three miles across. Road and rail bridges also link Zealand with Falster island and Falster with the island of Lolland; and before the Second World War there was a train ferry service between Falster and Warnemünde, in East Germany—now replaced by a service between Falster and Grossenbrode, in West Germany.

These facilities for through transport in Denmark, and between Denmark and its neighbours, have been an essential part of the policy on which Denmark embarked in the nineteenth century. Faced with an increasing population the country began an intensive development of its agricultural resources, and of dairy farming in particular, until it took the lead in dairying methods. Farms are small, the law forbidding the amalgamation of small properties into large estates; grass crops for the livestock are included in the crop rotations and grazed straight off the fields. Government education for farmers is advanced, and farming communities are highly organised; co-operative use of machinery, fertilisers, &c., is encouraged, while marketing schemes ensure that all produce is sold, and nothing left on the farmers' hands beyond what they need for their own use. The result is a country well on the way to being self-supporting in foodstuffs, with a large surplus for export: produce of a high quality whose reputation is known throughout the world and jealously guarded by the Danish Government.

Physically Denmark is well suited to this agricultural development: soils over a large part of the country are of glacial origin and fertile; the climate is mild, with a good rainfall; the highest elevation is 564 feet. Western Jutland is bounded by sand dunes and shallow lagoons, and inland the surface tends to be marshy and infertile, but even here planting of grasses and drainage have led the way to reclamation of over 2,000 square miles for agriculture or forestry. According to the latest returns of the United Nations Food and Agricultural Organisation, just on 3,000 square miles (18 per cent.) of the total area is classed as waste or built on, while forests and woodlands account for another 1,340 square miles (8 per cent.); but there remains practically three-quarters of the whole

(12,235 square miles; 74 per cent.) available for farming. The 7·8m. acres of arable and pasture land comprised in this last section combine nearly 5m. acres of cropland and nearly 3m. acres of permanent and temporary meadows and grazing grounds. By far the most extensive crops are cereals (over 3m. acres), chiefly barley (around 1½m. tons from over a million acres), oats (nearly a million tons from about ¾m. acres), and mixed grain (nearly ¾m. tons from less than ¾m. acres). The crops of rye and wheat are much smaller, and it is noteworthy that wheat is at the bottom of the list. Both the acreage and production of wheat fell off greatly during the Second World War and have been slow in recovering, though the yield per acre under intensive cultivation is very high. Noteworthy also, especially in its bearing on the dairying industry, is the scale on which root crops are grown. Apart from potatoes, averaging 2m. tons from ¼m. acres, root crops are grown on over a million acres and yield over 20m. tons. They include 2m. tons of sugar-beets from 150,000 acres, yielding 300,000 tons of raw sugar, as well as much larger quantities of residue material, of great value as a fertiliser and cattle food.

Livestock in 1950 included 3m. cattle, 3m. pigs, and half a million horses, but comparatively few sheep, which numbered under 150,000 before the Second World War and have decreased since the war till in 1949 they were only 65,000. On the other hand dairy produce has caught up with and in some cases surpassed the pre-war figures of production. In 1950 the yield of milk was over 5m. tons; of butter, 120,000 tons; and cheese, 60,000 tons.

Denmark has practically no minerals. The majority of Danish industries are based on agricultural products, and large quantities of prepared foodstuffs are exported, the United Kingdom having long been the principal customer. Other industries include cement manufacture, brewing, and shipbuilding. Coal and raw materials and most manufactured goods are imported.

Fishing is an important industry; in 1949 the catch was valued at over £9m. The long, sandy stretches of the west coast are broken by many little harbours suitable for fishing boats; but the large ports are on the Baltic coast of Jutland or on the islands. The principal port and city is Copenhagen (*København*—Merchants' Haven), the capital, in which most of the country's trade is concentrated. The Sound, on which it is situated, is the shortest route between the Baltic and the Kattegat, and formerly Copenhagen drew a large income from shipping tolls; but it has long been a free port, and nowadays the Sound is not deep enough for the largest ships, which prefer the Great Belt.

The largest ports after Copenhagen are Aarhus, Odense, and Aalborg. Esbjerg, the only important harbour on the west coast, is the chief port for the Danish export trade to Britain and the

terminus of a regular steamship service to and from Harwich. Helsingør (*Elsinore*), at the northern entrance to the Sound, is a bunkering place for steamers as well as the terminus of one of the train ferry services to Sweden.

TOWNS OF OVER 40,000 PEOPLE IN 1950

Copenhagen	975,000	Aalborg	80,000
Aarhus	116,000	Esbjerg	48,000
Odense	101,000	Randers	40,000

Outlying Territories

The Faeroes (Old Norse, *Fær-øer*, Sheep Islands), a group of islands between Scotland and Iceland, are equal in size to the Shetlands and support about 50 per cent. more people. Area, 540 square miles, with heights up to 2,800 feet; population, 30,000. Capital, Thorshaven (4,800). The climate is mild, and potatoes and turnips normally do well, but barley, which is also grown, does not always ripen. Sheep farming, fishing, and whaling are the mainstay of the islanders. Fish and whale products, including train oil; sheep-skins, wool and hosiery; and feathers collected from the colonies of sea fowl round the rugged coasts, are exported. A measure of home rule was granted in 1949.

Greenland. See under North America (p. 728).

ICELAND

For over 500 years, from 1381 to 1918, Iceland formed part of the Danish kingdom. In 1918 it was declared an independent state, sharing the same king as Denmark, but formulating its own internal policy; in 1944, as a result of a plebiscite, the island finally severed all ties with Denmark and was declared a republic.

Iceland lies immediately south of the Arctic Circle, which it touches at the tip of its north coast. With an area of 40,000 square miles, the island is larger by one-fourth than the whole of Ireland, but its population is less than 150,000. It is a volcanic island. About one-fifth of the surface is classed as productive land, mainly in the form of permanent meadows and grazing grounds near the coast and along the lower courses of the rivers. The rest is a waste of high plateaus and mountains, rising in the south-east to 7,000 feet, and partly covered by great ice sheets, largest of which is the Vatna Jökull. Active volcanoes include the famous Mount Hecla (5,000 feet), and geysers and hot lakes are characteristic features. The volcanic soils are in places extremely fertile, but of the land

classed as productive, comparatively little is actually cultivated—about 100 square miles: one-quarter of 1 per cent. of the total area of the island. Under a quarter of a million tons of hay, cultivated and uncultivated, are harvested, a few thousand tons of potatoes, and a few hundred tons of turnips. Livestock include nearly half a million sheep (between 3 and 4 per head of the population), 50,000 cattle and about the same number of horses.

Lying in the North Atlantic, Iceland reaps great benefit from the warm waters of the Gulf Stream Drift, which keeps the southern coast free from ice in most winters. Fishing for cod and herring is the island's principal industry, valued in 1948 at 200m. krónur (then about £7½m.). Fish, fish meal, herring oil, and sheep-skins are the chief exports.

The great bulk of the country's requirements have to be imported, and these have tended to exceed the exports, so that the krona has suffered repeated depreciation. The biggest share (30 per cent. or more) of both the imports and the exports is supplied or taken by Great Britain.

The chief port and capital of the republic is Reykjavik, in the south-west of the island. It has a sheltered harbour and contains over one-third of the total population. There are no railways in Iceland, but Reykjavik has an airport from which regular services are operated to other parts of the island, and to other countries.

FINLAND

The Second World War, in which Finland fought against Russia, led to revolutionary changes in her agrarian and industrial economy. Defeated in the war, she had to cede to Russia a large tract in the south-east, made up of Finnish Karelia with the north and west shores of Lake Ladoga, and part of the north coast of the Gulf of Finland, including the port of Viipuri (Viborg). Also she had to give up the strip of territory linking her on the north-east with the Arctic Ocean, this loss including the ice-free port of Petsamo. Finally, Finland had to lease to Russia for use as a military base a headland (Porkkala) to the west of Helsinki (Helsingfors), within artillery range of the Finnish capital and commanding the entrance to the Gulf of Finland.

These cessions cost Finland nearly 20,000 square miles of territory, but left her with 130,000 square miles, including the Åland Islands (570 square miles; population 30,000), which are of international importance because of their position in the mouth of the Gulf of Bothnia, between Finland and Sweden. The mainland territory, larger than the whole of the British Isles, but sup-

porting only some 4m. people, is comprised between the Gulf of Finland on the south and the Gulf of Bothnia on the west, and reaches north beyond the Arctic Circle to the 70th parallel: an extreme length from south to north of 700 miles and an extreme width of 400 miles. The great majority of the population is of Finnish stock, but there is an influential Swedish element which in former days was the dominant caste.

Popularly known as the Land of a Thousand Lakes (the actual number is more like 10,000, mainly in the south), Finland is nearly one-tenth water; a still larger area consists of swamps, partially covered with trees, while dry forest covers nearly half the total area. The Finnish name of the country, 'Suomi,' means 'Land of Fens and Lakes.' In general the surface is fairly flat and of no great elevation: mostly under 600 feet, broken here and there by higher patches; though along the Russian frontier and in the far north the general level is up to 1,500 feet, while in the extreme north-west, where Norway, Sweden, and Finland draw together, heights of over 4,000 feet are found. Running back from the coast are post-glacial plains with fertile clay soils, but even these are liable to frost in August, and for the most part Finland is not well adapted for agriculture. Geologically it is related to the Scandinavian peninsula, consisting mainly of granite, gneiss, and glacial formations, its multitudinous lakes filling hollows formed by ice-pressure in past ages. As a rule, the gravel soil formed by glaciation is not favourable to heavy crops; but it is admirably suited to the large vertical roots of the pine trees or the long creeping roots thrown out by firs. Among deciduous trees the birch is the most common.

Only 7 or 8 per cent. (some 6m. acres) of the total surface is cultivated. Cereals and potatoes account for about half this area, and land cropped for hay forms 40 per cent. Potatoes are the heaviest crop (over a million tons), though occupying much less ground than any of the four principal cereals, among which oats provide nearly three-quarters of a million tons from about a million acres, while the combined totals for wheat, rye, and barley come to much the same figures. Livestock include 1·8m. cattle (the majority milch cows) and 1·3m. sheep. The dairying industry has long been highly developed and before the Second World War there was an average annual export of 13,000 tons of butter and 5,000 tons of cheese. Since the war the export of cheese has revived, but the export of butter has disappeared and there is a varying import (2,000 tons in 1950), though the production of factory butter has been increasing and in 1950 amounted to 56,000 tons.

Two special factors in Finland's post-war situation have led to radical changes in her economy. On the one hand she had to provide Russia with industrial products to the value of 300m. gold dollars, as reparations, spread over eight years from 1944. On the

other hand, she had to accommodate some 425,000 refugees from the ceded or leased territories. The first claim was met by industrial expansion, particularly in shipbuilding and the heavy engineering and metal industries, which were developed to supplement forest products. Before the war, the number of industrial workers was 214,000; in 1951 it had risen to 400,000—10 per cent. of the total population. Nearly 200,000 of the refugees had been engaged in industry or trade and it was comparatively easy to find work for these in the enforced industrial boom. Farms and farm workers were a different proposition. They and their families came flooding into the republic to the number of nearly a quarter of a million. To meet this need, farm lands in Finland were redistributed. Large properties were bought or expropriated and split up; others were compulsorily reduced in size. The number with more than 250 acres was cut from over a thousand to half that number, and nearly 85 per cent. of the farms now have a maximum of 25 acres of arable land.

Industrial development took on a permanent character; Russia undertook to provide a market for Finnish manufactures on an ordinary commercial basis, after the expiry of the reparations period. Meanwhile, Finland's normal export trade revived. At first she could do little more than meet the reparation claims, but as she recovered strength after the war, these were exceeded by her exports to Western Europe of her main source of economic wealth—timber and other forest products. In this market the United Kingdom is her largest customer, and Finland is one of Britain's chief sources of supply, especially since post-war financial conditions began to limit trade with the dollar countries of North America. Imports of wood and timber into the United Kingdom from Finland in 1950, mostly under the heads of sawn softwoods and pit props, amounted in value to over £12m., or more than one-eighth of the total imports of wood and timber; only France supplied a slightly larger proportion. Finland was also second in the list of countries supplying wood-pulp to the United Kingdom in 1950. She sent pulp to the value of £12m., or more than a quarter of such supplies: a figure surpassed only by Sweden.

Finland has a big advantage in her intricate system of lakes and connecting rivers and canals, which greatly facilitate the inland transport of timber to her sawmills and pulp mills, and to shipping points on the coast. The length of navigable waterways is some 2,700 miles, while waterways along which timber rafts can be floated extend to ten times that distance. In addition there are nearly 2,900 miles of 5ft.-gauge railway, of which all but 160 miles are State owned.

Home of a seafaring people, Finland had a large fleet of tramp steamers before the Second World War. During the war she lost

nearly half, and the best of what remained were handed over to Russia as part of the reparations. At the beginning of 1951, Finland's mercantile marine totalled 652 ships, including 376 steamers averaging 1,200 tons. The principal towns are nearly all ports, and many of them are shipbuilding centres. The capital, Helsinki (Helsingfors), is also the principal port; it lies on a fine harbour, and though hampered by ice in winter it can usually be kept open by ice-breakers. The principal manufacturing town, Tampere (Tammerfors), is one of the few important inland centres, situated on the shores of a lake. Known as the Manchester of Finland, it has a large textile industry, run by hydro-electric power generated from rapids which flow through the town. Turku (Åbo), situated on the south-west coast, opposite the Åland Islands, is the old capital; it has timber and wood-pulp industries, and, with the ports of Pori (Björneborg), Vaasa (Vasa), and Oulu (Uleåborg), all on the Gulf of Bothnia, handles the timber export trade and the import of foodstuffs and other goods.

The three largest towns, with their populations to the nearest thousand at the beginning of 1950, are Helsinki (399,000), Turku (107,000), and Tampere (105,000). After these there is a big drop to the next largest group: four towns with populations of between forty and fifty thousand, namely, Pori (46,000), Lahti (43,000; in the southern coastal plain to the north of the Gulf of Finland), Vaasa (41,000), and Oulu (40,500).

SPAIN

Spain shares with Portugal possession of the Iberian Peninsula, which is about two and a half times the size of Britain but has only about three-fourths as many people. Spain has by far the larger share—85 per cent. of the area and nearly 80 per cent. of the population; it covers 190,000 square miles and supports 28m. people, an average of about 150 persons to the square mile. The density of population is highest round the coasts; large areas of the interior are very sparsely settled. This factor is explained partly by the character of the surface and the resulting poor communications, partly by the dry climate. South of the Pyrenees, which form the frontier with France, and the mountains at the back of the north coast, the greater part of the country is occupied by a tableland, with an average height of 2,600–2,700 feet, bordered everywhere except in the west by mountains and steep slopes, making railway construction difficult and costly, while the scanty population and restricted natural resources of large areas hold out little prospect of remunerative returns from schemes for development.

To add to the difficulties, strategic considerations and the national aloofness led to the Spanish railways being built on gauges other than the standard European gauge (4ft. 8½in.), so that through traffic with the outside world is impeded; not only have passengers to change trains at the French frontier, but goods have to be unloaded and loaded again. The same difficulty is not experienced at the Portuguese frontier, the principal Portuguese railways being on the same broad gauge as their neighbour's. As might be expected from the natural conditions, Spain's railway mileage is comparatively small (11,000; *cf.* France's 26,000). Nearly 75 per cent. (8,000 miles) have a broad gauge (5ft. 5½in.), while most of the rest are of metre gauge (3ft. 3·37in.). Routes over the plateau converge on Madrid or on local centres such as Salamanca and Valladolid; coastal lines converge on the leading ports—Barcelona, Valencia, Bilbao, and Cadiz.

The rivers of the peninsula, though of considerable length, add little to the means of communication. They are for the most part too much obstructed by shallows and rapids to be navigable for any great distance, and as their beds lie mostly in deep valleys below the level of the tableland, they cannot advantageously be connected by canals. All the main rivers except the Ebro flow westwards to the Atlantic, and often the lower, navigable stretches are within Portuguese territory. The Guadalquivir is the most important Spanish river as regards navigation; its volume is reasonably constant, being maintained in winter by rain, in summer by melting snows of the Sierra Nevada, the lofty range that borders its basin on the south. Ocean-going steamers can reach Seville, 70 miles from the sea, while strings of barges can go up to Cordoba, more than as far again. The only navigable river on the Mediterranean side is the Ebro, which allows small craft to ascend as high as Logroño, though sea-going vessels do not go beyond Tortosa, about 25 miles from the sea. The lower course of the river can be used by sea-going vessels only during high water, and a small canal has been cut to the sea from Amposta, above the delta, so that vessels may enter and leave at any time. Running parallel to the Ebro from Tudela to Zaragoza (Saragossa), a distance of about 60 miles, is a small canal, interesting as being, in part at least, one of the oldest canals in Europe; its construction was ordered in 1529, though most of it actually dates from the eighteenth century or later.

The climate of the interior is also unfavourable to any great density of population. Over the greater part, the total rainfall is under 20 inches a year, though the northern and north-western coasts receive a considerably higher fall, distributed throughout the year. Elsewhere, such little rain as there is occurs in winter, and the height of summer is a period of extreme drought, especially in the

southern half of the peninsula. Summer temperatures are high, and the whole peninsula, except for a comparatively small area in the north-west, has at least eight months with a mean daily temperature of 50° F. or more. Thus the most thinly peopled plateau areas are those of great heat and drought, in many places with only a thin soil-cover bearing little vegetation beyond a few tough grasses, herbs, and shrubs. Snow is rare, though winter temperatures on the plateau are low.

One advantage of the long hot summer is that valuable crops can be grown in quick succession wherever water is available for irrigation. In particular, the waters of the Ebro are being increasingly used in this way, and its almost desert-like natural basin is being turned into an agricultural region. Irrigation schemes dating back to the Moors, or even to the Romans, have made famous the *huertas* (horticultural lands) of Valencia and Murcia, the *huerta* of Elche, and the *vega* (agricultural plain) of Granada. A distinction is usually made between the *vegas*, which yield only one crop a year, and the *huertas*, which yield two or more. By the construction of dams and artificial lakes, the production of hydro-electrical power is associated with the irrigation works.

Despite the arid climate of the interior, Spain is predominantly a farming country, especially on the pastoral side. Unlike Portugal and most other European countries, it has not a high proportion of woods and forests—about 10 per cent. of the total area; but even this is 19,000 square miles, or 12m. acres. About 85 per cent. of the total (over 160,000 square miles; 105m. acres) carry crops of one kind or another, the greater part (90,000 square miles; 58m. acres) being pasture land. A post-war (1948) livestock census recorded some 16m. sheep and 4m. goats, 3m. cattle, 3m. pigs, 600,000 horses, and 1½m. asses and mules, these numbers being, in general, well below the pre-war returns. Cereals occupy 17m. acres, olives 5·4m. acres, vegetables 4m. acres, vineyards 3·8m. acres, fruit 1·4m. acres, while about 12m. acres lie fallow.

In southern Spain, vegetables and fruit are the chief crops on the irrigated land, along with rice and maize. The principal maize areas, however, are in the wetter parts of the country (the north-west), where maize is the staple foodstuff. In Spain as a whole, wheat and barley are both much larger crops. Wheat will grow on the more fertile soils of the plateau, particularly around Valladolid, and altogether it accounts for more than half the total area under cereals, occupying some 10m. acres yielding as a rule about 2½m. tons—10 bushels per acre. About half that quantity of barley is grown, and much smaller crops of oats and rye. Usually the wheat crop is insufficient for home needs, and wheat heads the list of imports in value, though raw cotton runs it close and sometimes takes the lead.

Despite some falling off in production, Spain is still the world's leading olive country. Grown for the most part on the slopes behind the Mediterranean coastal plains, olive trees cover more ground than any crop except wheat. Comparatively few olives are grown for direct consumption; crops are mainly for the extraction of oil, which was a major export before the Second World War, and since the war has been credited with earning the greater part of Spain's dollar income. The United Kingdom is also a large importer of refined olive oil. The yield of oil is about one-fifth of the weight of the fruit.

Oranges are an even more valuable factor in Spanish foreign trade. They are grown chiefly in the Mediterranean provinces of Valencia and Castellon, and though the area devoted to them is relatively small—only about 4 per cent. of the area under olive trees—the crop of oranges averages in weight 50 per cent. of the olive crop before the extraction of oil, and has an even larger export value than the oil. Indeed, oranges vie with cotton fabrics and laces for first place in the list of Spanish exports by value.

Figs, pomegranates, and bananas are also among the sub-tropical fruits grown in Spain. Large quantities of wine are made, notably sherry, which came first from Spain (see p. 148). Other products include esparto grass—a wild product—and the cork oak, which has to stand for thirty years before it yields good cork, and then gives increasingly better cork at subsequent strippings, which may be repeated at intervals of about ten years till the tree is perhaps 150 years old.

The mineral wealth of Spain is very abundant, and has been renowned for ages, though even yet it is far from being fully developed. Iron ore exists in immense quantity in the Basque provinces, and above all in the province of Viscaya. Bilbao, the port from which the ore is dispatched, is one of the most important iron-ore exporting ports in Europe. Santander and Murcia provinces also rank high in iron-ore production, while large quantities are also mined in the province of Almeria and near Seville, and smaller quantities in Malaga and in Lugo (north-west Spain, not far from Corunna). All these deposits furnish considerable quantities of ore rich in iron (for the most part from 48 to 60 per cent.), and sufficiently free from phosphorus to be used in the manufacture of steel by the Bessemer process. Many of the Cartagena mines have a poor iron content, but on the other hand they are mostly rich in manganese, and their phosphorus content is uniformly low. The deposits worked near Teruel in eastern Spain and exported from the port of Sagunto, while rich in iron, have a rather high proportion of phosphorus—from 0·06 to 0·39 per cent. The Viscaya deposits, which have been worked since ancient times, are apparently the nearest to exhaustion. Other parts of Spain (Leon, &c.) possess

ores of lower quality which may come to be of importance in the future. The production of iron ore in 1950 was 3m. tons, and of iron pyrites 1½m. tons. Exports of each are in the neighbourhood of 1m. tons.

The highest mineral production is actually that of coal (between 9m. and 10m. tons a year), the principal mines being in Asturias, in the north-east. A special railway runs from the mines to the exporting and distributing centre of Gijón; it is estimated that the potential reserves are far higher than figures of actual production would show. Anthracite and lignite are also worked, and each yields annually between 1m. and 1½m. tons. Copper ores are mined to the amount of about a quarter of a million tons a year at Río Tinto, in the south-west, and lead and silver at Linares, to the south of the Sierra Morena. Large mercury deposits are worked in New Castile, at Almadén. Other minerals include phosphoric salts, zinc, tin, sulphur, manganese, and salt.

The situation of the chief seats of Spanish manufacturing industries has been determined more by conveniences for commerce than by local supplies of coal and iron. Electric power is being increasingly used in industry. Over 1,200 power stations have a capacity of some 3m. h.p., and the annual output registered is around 6,000m. kwh. The metallurgical industry, based on Spanish iron and coal, is concentrated on the north coast, where water-power from the Cantabrian Mountains is now used for smelting. Bilbao is the centre of the iron industries, and also of the iron export trade. Though in a position to supply all the coal she needs from her own mines, Spain has a large import of coal from the United Kingdom, in return for the exported iron ore. Principal industrial areas of the south are centred on the ports of Seville, Málaga, and Cartagena; Barcelona is the centre of the Catalonian textile industry, which produces both woollen and cotton goods. Esparto grass is the basis of paper manufacture, while Valencia and Murcia have silk industries, for which large numbers of silkworms are reared.

Over half a million tons of fish a year are caught off the Spanish coasts, mostly sardines, tunny, and cod. A large amount is canned.

Since the overthrow of the Spanish monarchy, and the establishment of the present State in 1939, industrial and commercial concerns have been subjected to multiple regulations in the interests of labour and social welfare. A State body, *Instituto Nacional de Industria*, was established in 1941 to promote projects too big for private enterprise. Recent developments include an oil refinery with a capital of £3m., and a scheme in Asturias for steel works with a target of 600,000 tons a year. Another State body, *Instituto de Colonización*, has been put in charge of land organisation. Development, since the Civil War of 1936-39, has been somewhat

chequered. The production of iron ore and the staple crops has fallen, the fall being aggravated in the latter case by four years of drought between 1945 and 1950; on the other hand, the production of coal, cotton, and electric power has risen.

Spain has many good ports to handle her foreign trade. The largest is Barcelona, with a fine sheltered harbour. Among others on the Mediterranean coast are Valencia, Alicante, Cartagena, and Malaga. On the Atlantic side of the Straits of Gibraltar, Cadiz has a good harbour and shares the trade of south-west Spain with Seville, on the Guadalquivir. On the north coast Bilbao is of prime importance, and other ports include San Sebastian, Santander, Gijon, and Corunna. Madrid, the capital, almost in the centre of the country, has a variety of industries, and is of first importance as a road and rail centre.

The Balearic Islands, ranging from 50 miles to 200 miles off the east coast of Spain, rise above the Mediterranean from submarine plateaus stretching in a north-easterly direction, in line with the mainland promontory which juts out between Valencia and Alicante. There are four main islands—Mallorca (Majorca), Menorca (Minorca), Ibiza (Iviza), Formentera—and seven islets, with a total area of 2,000 square miles and a population approaching half a million, the whole forming a province of Spain (Balears). The islands produce wheat, fruit, and olives; fruit and wine are exported, with a little iron from Menorca; coal, timber, fertilisers, and foodstuffs are imported. The capital, Palma (140,000), on Mallorca, has a regular steamship service with Barcelona (150 miles). The principal towns of the other islands are Mahon on Menorca and Ibiza on the island of the same name.

TOWNS WITH OVER 100,000 POPULATION IN 1950

✓ Madrid	1,511,695	Vigo	139,170
✓ Barcelona	1,285,920	Valladolid	130,475
✓ Valencia	534,866	✓ Corunna	129,562
✓ Seville	390,755	✓ Cartagena	120,208
Malaga	295,757	✓ San Sebastian	116,285
Zaragoza	271,587	Alicante	107,596
✓ Bilbao	235,508	Santander	107,226
Murcia	220,290	✓ Gijon	107,156
Granada	174,663	Jerez de la Frontera	107,040
✓ Cordoba	164,415	Oviedo	106,825
Palma (Mallorca)	140,966	✓ Cadiz	99,910

PORTUGAL

Portugal comprises the western coast plains of the Iberian peninsula and is traversed by several large rivers, which, though rising in the Spanish mountains and having the greater part of their courses in that country, only become navigable in Portuguese territory. This factor, together with the greater rainfall of Portugal, more evenly spread over the seasons than the scanty fall of the Spanish interior, has led to more intensive agricultural development and to a heavier density of population than is found in the greater part of Spain. With an area of 34,000 square miles (a little larger than Ireland) and a population of 8m., Continental Portugal occupies between one-sixth and one-seventh of the peninsula and supports between a fourth and a fifth of the total population.

More than one-fourth of Portugal (9,500 square miles) is under forest, mostly pine and oak, and of this area in turn more than one-fourth, comprising nearly 2,700 square miles, or nearly 1½m. acres, is covered with cork oak. Portugal provides the bulk of the world's cork supplies, and cork heads the list of her exports by value, accounting for about one-sixth of the total. Two other forest products, resin and turpentine, are important exports, especially resin, which provides 5 per cent. of the total export trade.

Agricultural and pastoral industry in general yield comparatively little for export. Apart from the forests, over two-thirds of the country (68 per cent.) is capable of production, but 30 per cent. is unused, and the land actually farmed, both arable and pasture (separate figures are not published), accounts for no more than 38 per cent. of the total—about 13,000 square miles or over 8m. acres. The mild, moist climate of northern Portugal is favourable to livestock and dairy farming, while the summer rainfall favours maize to a greater extent than in Spain. Farming methods are usually primitive and crop yields are low. The production of cereals is normally insufficient for home requirements, and both wheat and maize are imported, in quantities varying with the size of the home crop. Wheat is grown on nearly 1½m. acres, yielding up to half a million tons (about 10 bushels to the acre); maize on about 1¼m. acres, yielding on average a crop almost as heavy as that of wheat. Crops of oats, barley, and rye are all on a smaller scale.

About a million tons of potatoes are produced from rather more than 200,000 acres.

Formerly the wines of Portugal—notably her speciality, port (see p. 148)—took pride of place among the exports, and they still rank next to cork. Olive oil, though a good deal lower in the scale and variable in quantity, is another valuable commercial product. Rice is grown on swamp lands, notably in the province of Estremadura on the flats of the lower Tagus, in the province of Beira farther north, and in the southern provinces of Algarve and Alentejo. Its cultivation has tended to increase, and in 1950 a record area of 120,000 acres under rice yielded a record crop of 135,000 tons.

There are (1953) no later figures for livestock than the census of 1940, when sheep numbered 4m., oxen nearly a million, and goats and pigs each 1½m., while horses were only 85,000.

Fishing is one of the most important industries, the chief catch being sardines. The bulk of the catch is tinned and forms the leading export after cork and wines. Centres of the industry are Matozinhos, in the neighbourhood of Oporto; Setubal, on the bay of that name, south of Lisbon; and Portimao and Olhao, on the south coast.

There is considerable mineral wealth, but its development is hampered by the limited supply of electric power. Coal, cupriferous pyrites, and cement are each produced to the amount of about half a million tons a year, and minor quantities of other minerals include a small but valuable export of wolframite. Electric power is being developed, but the annual production is under 1,000m. kwh. In manufacturing industry cotton plays a big part. Raw cotton is a leading import (20–30,000 tons a year), and cotton piece goods, dyed and printed for the African market in the Portuguese colonies, are a substantial export.

In the last twenty-five years Portugal has made great progress in many ways. Cities and towns have been replanned and laid out afresh with modern drainage systems, many housing estates have been built, and good roads have replaced dusty tracks. Educational facilities have been increased and a drive made against illiteracy, which was very prevalent; as late as 1940 nearly half the population could neither read nor write. Health insurance and other welfare schemes have been started, but the position of the workers is still precarious; a bad farming season can cause great unemployment in agriculture, while a poor sardine season can cause the same crisis in the fishing industry.

The capital of the republic and its principal port is Lisbon, on the north shore of the Tagus estuary. The valley of the Tagus marks the division between the wetter, more prosperous northern part of Portugal, and the drier, less productive south. Lisbon is

the focus of routes from all parts of the country, and, as well as handling a great deal of the foreign trade, has also a large passenger traffic, being the nearest European port to South America. The trade of northern Portugal passes through Oporto, on the River Douro, or through the modern port of Leixoes, just outside the river estuary, which has the advantage of easier approach, deeper water, and excellent facilities for handling goods. Lisbon, with a population of three-quarters of a million, and Oporto, with over a quarter of a million, are the only two large cities. After them there is a big drop to the next largest, Coimbra and Setubal, each with under 50,000.

The Azores, in mid-Atlantic, and Maderia (p. 717) are administered as parts of Portugal. The **Azores** comprise three groups of islands—total area 890 square miles; population 317,000 (1950 census). Cereals and fruits (oranges, pineapples, &c.) flourish and are exported. Chief port, Ponta Delgada (23,000), on St. Michael's.

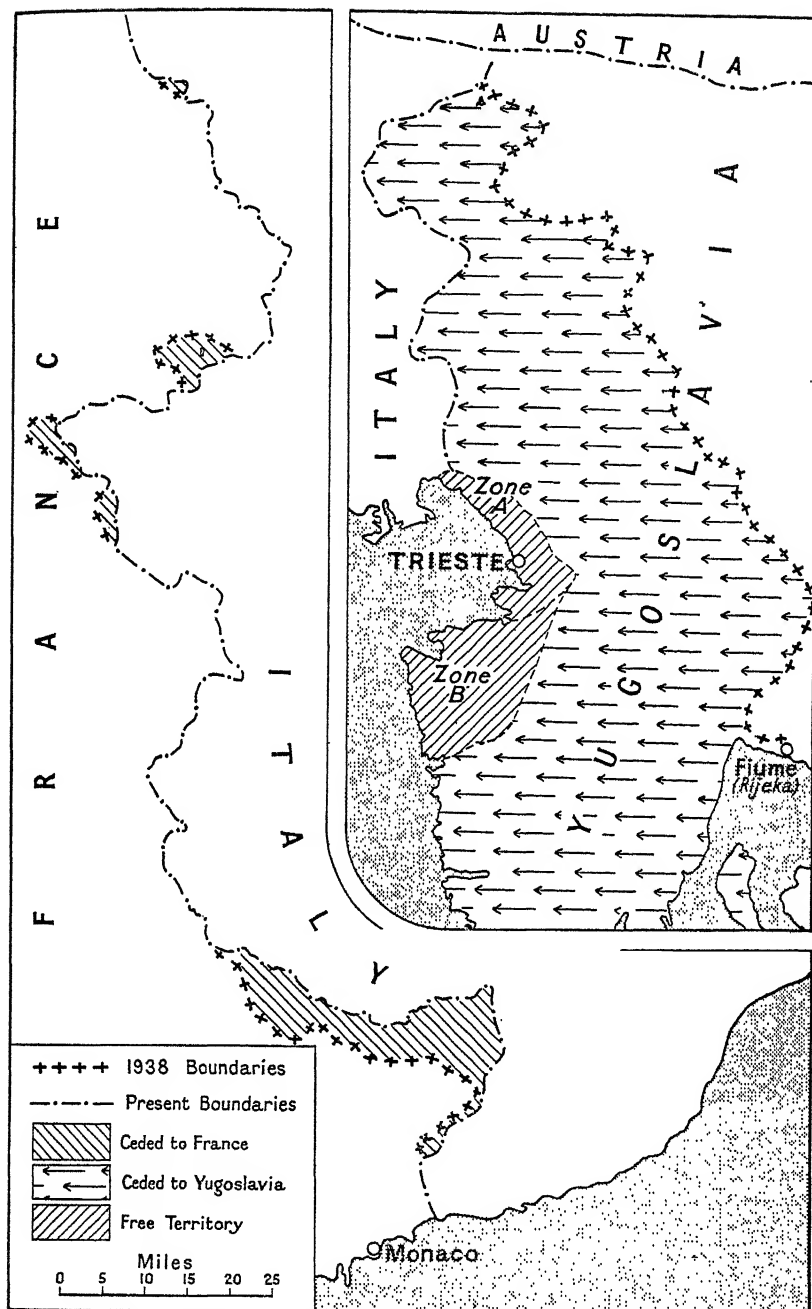
GIBRALTAR

Gibraltar, dominated by its famous Rock, occupies a narrow peninsula less than three miles long and about three-quarters of a mile wide, extending southwards from the south-west coast of Spain, with which it is connected by a sandy isthmus about a mile long and half a mile wide, rising only a few feet above sea-level. Barely a couple of square miles in area, with a civilian population of 25,000, Gibraltar's importance is chiefly strategical. It was ceded to Great Britain by the Treaty of Utrecht in 1713, after it had been seized in 1704 during the War of the Spanish Succession. The Rock, which rises to a height of 1,396 feet, descends almost sheer to the sea on its eastern side, and the town is huddled on the western slopes, overlooking the great harbour, symbol of Gibraltar's strength as a naval base commanding the entrance to the Mediterranean. It has the status of a British Crown Colony under a Governor and Executive Council, to which was added in 1950 a Legislative Council, with a membership half official or nominated and half elected, in addition to the Governor as President. Gibraltar's economy is almost solely that of a naval base and military fortress, and about half the wage-earners are employed in Service or other public duties. There is no land suitable for agriculture or other primary industries, but as a port of call and coaling station for all nationalities the colony enjoys a certain amount of transit trade. In 1951, imports were valued at £6·7m. About 5,000 vessels enter and clear in a year, with an average net tonnage of under 2,000. A recent development has been the establishment of a sardine cannery and a plant for extracting oil from olives, for export purposes.

ITALY

The Republic of Italy, established in 1946 after the Second World War, differs very slightly in area from the pre-war kingdom; under the Peace Treaty of 1947 Italy ceded four Alpine frontier districts to France, a considerably larger territory to Yugoslavia, including the port of Fiume (now combined with the Yugoslav port of Sušak and renamed Rijeka), the Dodecanese archipelago to Greece, and a small island to Albania. An enclave based upon Trieste was made a Free Territory (p. 448), but in 1953 the occupying Powers (Britain and U.S.A.) proposed to restore Trieste and its immediate district (Zone A) to Italy. Before the war Italy had an area of 120,000 square miles; she was left with 116,000 square miles—a territory nearly a third larger than Great Britain. Her population, 47m. at the 1951 census, was then slightly less than Britain's 49m.

Though Italy's territorial losses were relatively small, the effects of the war on her industrial and financial economy were of a very different character. The exchange rate of the lira, which in 1939 stood at 85 lire to the £, rocketed to 1,750 to the £, and in 1951 her special imports (i.e., for home consumption) and special exports (i.e., of home produce) were each valued in the United Nations *Year Book of International Trade Statistics* at over a million million lire. Their analysis is still a guide to the commercial resources and needs of the country. Imports were nearly a third greater than exports, with a value of 1,323,488m. lire, or, at the post-war rate of exchange already quoted, £756m. Between a fifth and a sixth of this was food, the biggest item being wheat. Fuel (coal, coke and petroleum) accounted for another fifth; and nearly twice as much (36 per cent. of the total) was spent on inedible raw materials, chiefly cotton and wool. Together these imports made up about three-fourths of the whole, leaving around one-fourth for manufactures, with iron and steel, copper and tin, and machinery as prominent items. On the other hand, manufactured goods provided by far the greater part (two-thirds and more) of the exports, which were valued at 1,017,818m. lire (£582m.). Textile yarn and thread and textile fabrics provided one-third, and machinery and transport equipment one-sixth. Very little fuel was exported, and that almost exclusively petroleum products. Food was again between a fifth and a sixth of



ITALY: FRONTIER MODIFICATIONS IN THE PEACE TREATY, 1947.

the total, and on this side of the trade account consisted mostly of fruit and nuts, vegetables, and rice.

Geographical factors enter largely into Italy's resources and needs. Structurally and climatically the country falls into two distinct regions, the northern plain and Alpine foothills, and the peninsula. The northern plain, tipped eastwards and drained to the Adriatic by the River Po and its tributaries, is shut in on the north and west by the great Alpine ranges, which cut Italy off from Central Europe; on the south by the Apennines, curving round from the western end of the Alps to traverse the length of the peninsula. In the natural trough between the two ranges, the plain has been built up by the collection of sediment, a process which is still going on, for the Po carries to the Adriatic every year sediment which is extending the coast eastwards. Adria, now 13 miles inland, was in Roman times an important port. Large tributaries from the Alps—the Dora Riparia, Dora Baltea, Ticino, Adda, and Chiese—have pushed the main river over to the southern side of its great plain. Dykes have been built to check flooding of the slow-moving, sediment-laden river, and its waters are used extensively for irrigation, for though there is a good summer rainfall, summer temperatures are high and many crops need irrigation. Winter is very cold in the plain, the Apennines cutting off the northern part of the country from the Mediterranean influences, and so subjecting it to the more extreme continental type of climate.

In spite of this, the fertile soil, summer rain, and abundant water render the Lombardy plain the most productive part of Italy. Small farms are the rule, often less than three acres, and primitive methods and implements, such as the wooden plough, are still in use in some localities, though much is being done by the government to sponsor mechanical farming methods, proper crop rotation and the use of artificial fertilisers. Hay is one of the main products, yielding everywhere three crops a year, and in places seven or eight; wheat and maize are also grown, and in the irrigated areas rice. Cattle raised on the rich meadows have a high milk yield, from which has arisen a large cheese-making industry; Gorgonzola, Parmesan, and Stracchino cheese are all made here. Flax and hemp are also grown, and the rearing of silkworms is an important occupation; mulberry trees are grown specially for their leaves, on which the young worms are fed.

The Italian peninsula can be said to begin at the foothills of the Apennines along the southern edge of the plain, this demarcation being very clearly followed by the straight, 165-mile long railway from Rimini on the Adriatic coast to Piacenza on the Po. From the western end of the Alps the Apennines swing across the peninsula to Ancona, enclosing the hilly country of Tuscany and

the Campagna on the west, then continue through the peninsula into Calabria (the 'toe' of Italy) and on into Sicily. With the exception of the Tiber (250 miles) in Tuscany, and the Arno (155 miles), rivers are short and flow directly to the sea from both sides of the range. The climate of the peninsula is typical of all Mediterranean countries—dry, hot summers, and mild, wet winters.

On the west coast of the peninsula there are four large plains among the hills of Tuscany and Campania: those of the Arno, the Ombrone, the lower Tiber, and that behind Naples. The Arno plain, with Florence at its head, has been drained, irrigated, and cultivated extensively, though farms are too small and often too poor to provide more than their own needs in foodstuffs. Wheat and grass crops are grown, with olives and the vine, and some of Italy's best known agricultural products come from this region—Chianti wine, Lucca olive oil, and Leghorn straw. The Ombrone valley, formerly a marshy and malarial region, has been reclaimed and is being resettled agriculturally. The plain of the lower Tiber, with Rome as its centre, is also a reclaimed marsh region, where farms and irrigation works have now been established. The city itself is built on hills overlooking the surrounding plain. The plain of Naples, the most densely settled part of Italy, is very intensively cultivated. With highly fertile soil and an almost sub-tropical climate it produces wheat and maize, oranges, lemons, olives, hemp, vegetables, and the vine.

The mountains themselves are largely given over to sheep grazing, though large chestnut forests flourish on the lower parts.

Sicily, separated from the 'toe' of Italy by the narrow Straits of Messina, has a good winter rainfall, and in places a highly fertile soil. Citrus fruits are grown on the coastal lowlands, with vines and olives; wheat is the chief crop in the interior, where sheep are also kept. Not much smaller—a fourth instead of a third as large again as Wales—is the island of Sardinia, over 100 miles from the west coast of Italy, but only seven miles south of Corsica. It is largely mountainous, barren and poverty-stricken, but supports 2m. sheep on rough hill pastures and has a considerable area under wheat. Its mineral resources are varied and extensive.

More than nine-tenths of Italy is occupied by farmlands and forests. Woods alone cover over 21,000 square miles, and pasture and rough grazing land nearly 20,000 square miles. Greater than either of these totals is the area devoted to cereals which is returned as nearly 27,000 square miles (over 17m. acres)—more than half the size of England. Wheat is by far the largest crop; it is grown on about 12m. acres and yields a harvest of some 7 to 8m. tons (250–300m. bushels). Yet even this large crop is not enough for home consumption, and imports of wheat, while naturally varying

with the season, have ranged up to 50m. bushels. A noted feature of the home production is a hard wheat grown in Apulia; it is especially suitable for making macaroni. Maize, the second largest though much smaller cereal crop, covers some $3\frac{1}{2}$ m. acres and produces some $2\frac{1}{2}$ to $3\frac{1}{2}$ m. tons. Other cereal crops—oats, barley, rye—are cultivated in the hill country, but on a much smaller scale.

Vineyards occupy $2\frac{1}{2}$ m. acres, and vines are grown in the midst of other crops on a further 7m. acres. The annual production of wines amounts to some 800m. gallons, and there is a considerable export. Similarly, while olive groves occupy some 2m. acres, olive trees are grown among other crops on a further $3\frac{1}{2}$ m. acres; and olive oil is extracted from the fruits to the extent of 165–175,000 tons a year. Citrus fruits, chiefly oranges and lemons, grow profusely and supply half a million tons a year for export. Sugar-beet is prolific, and though grown on only about a third of a million acres yields 4 to 5m. tons a year (about the same as production in the United Kingdom). Apart from its fodder value, nearly half a million tons of sugar is obtained from this crop. Chemical fertilisers are largely used on the land—about 2m. tons a year, nearly two-thirds of the total being superphosphate.

Livestock include 10m. sheep, 8m. cattle, 4m. pigs, a million donkeys and mules, and three-quarters of a million horses.

In 1950 a law was passed providing for the expropriation of large estates to the extent of $1\frac{1}{2}$ m. acres, with a view to the relief of unemployment and increase of production by sub-division into small holdings. By the autumn of 1951 about 250,000 acres had been expropriated, but settlement was proceeding so slowly that bands of peasants were taking the law into their own hands and occupying—till ejected—large estates around Civitavecchia and in the Alban Hills.

Italy is not well supplied with mineral wealth, and needs large mineral imports to meet her industrial requirements. Under the early stimulus of war, the combined output of iron pyrites and iron ore amounted to $2\frac{1}{2}$ m. tons in 1941, and though there was afterwards a big drop, an annual output of about $1\frac{1}{2}$ m. tons has been developed since the war. The production of pig-iron is only about half a million tons, and it is only with the aid of domestic and imported scrap that an output of some $2\frac{1}{2}$ m. tons of ingot and casting steel is achieved. About a couple of million tons of coal and similar fuels are produced annually and several times that quantity has to be imported, though the deficiency is partly made good by the use of hydro-electric power, which has been and is being largely developed. The total electric power generated in the course of a year is (1951) upwards of 20,000m. kwh., of which well over 80 per cent. is supplied by hydro-electric plants; and it is estimated that by 1954 Italy's total yearly capacity will have been

increased to 38,000m. kwh. Most of the supply is generated in northern Italy, though the south provides a considerable share, especially in winter, when the stations in the Alpine foothills are hampered by lower water levels. The output of petroleum is comparatively trifling, but supplies of natural gas (methane), discovered in the Po valley in 1949 in the course of prospecting for oil, may provide the yearly equivalent of nearly 1½m. tons of coal.

The only minerals producing any notable surplus for export are sulphur and mercury. Italy vies with Spain as the world's chief producer and exporter of mercury (quicksilver). Since the Second World War she has produced from 3m. to 4m. lb. a year. Sulphur rock, mined in Sicily in the neighbourhood of Caltanissetta, Girgenti, and Catania, and yielding in recent years between 150,000 and 200,000 tons of crude sulphur annually, is Italy's most important mineral product from the point of view of international trade. The potential supplies are vast. It is calculated that over the past hundred years Sicily has produced 25m. tons from an area smaller than Middlesex, and this is less than 10 per cent. of the total. But the mining methods are primitive, and not only has production dwindled, but without radical changes it is unlikely to increase again to former levels.

Lead and zinc are mined in Sardinia, bauxite in the Abruzzi. Building and decorative stones are a valuable asset; the celebrated statuary marbles of Carrara and Massa come from the Apuan Hills north of Pisa.

Industry in Italy is concentrated mainly in the northern plain, and owes its modern development largely to hydro-electric power. In the forefront are textile manufactures. There are over a thousand cotton factories with nearly 6m. spindles, and between five hundred and a thousand woollen factories. Cotton and woollen goods are important items of the export trade, and so are rayon ('artificial silk') and pure silk. The production of rayon has increased very rapidly and at the turn of the half-century approached 100,000 tons. Silk culture is practised all over Italy, though mainly in the north. Over 1½m. spindles are engaged in the industry, and nearly 2,000 tons of raw silk are turned out annually.

Iron and steel industries are widespread, the chief centres being Milan, Savona (west of Genoa), Terni (between Perugia and Rome), which has the benefit of water-power from the Nera; and the Isle of Elba, where locally mined iron ores are smelted on the spot. A great chemical industry has grown up, utilising Italian sulphur, borax, and other raw materials in the manufacture of sulphuric acid (1½m. tons in a year), fertilisers, and other chemicals. Motor-cars are another important manufacture, both for the home market and for export.

Other characteristic manufacturing industries are mainly those

of an artistic or semi-artistic nature. Venetian glass and Murano lace have long been famous. Florence produces fine earthenware and mosaics; many Italian towns are famed for their sculptures in marble and alabaster and their artistic woodwork. Milan is the chief seat of Italian cutlery manufacture; Tuscany is well known for straw plaiting, and there is a growing leather industry.

Italy has many large cities which enjoy world-wide renown for their associations with history and art, but are less widely recognised as centres of industry and trade. Rome, Milan, and Naples have each over a million inhabitants. Rome, the largest as well as the capital city, owes its pre-eminence more perhaps to historical than to geographical circumstances; but its situation is not without geographical advantages. It lies about midway between the north and the south of the republic, on the chief river of the peninsula. It has the usual variety of industries associated with capital cities—food preparation, furniture and clothing, luxury goods, &c. Ostia, at the mouth of the Tiber, is now its port, though Civitavecchia, further to the north, formerly handled most of its sea-borne traffic. Milan, next to Rome in size and the chief business centre in Italy, became a great seat of trade at a very early date, chiefly in consequence of its central position in one of the most fertile parts of the northern plain. Routes over the Alps converged there by way of the shores of Lakes Maggiore and Como, and this advantage was increased later by the St. Gotthard and Simplon railways. Naples, apart from its fine harbour and maritime trade, has such abundance of labour that it has become the seat of various manufactures, including textiles, for which otherwise it offers no particular advantage.

Among other large cities, taken in order from north to south, Turin, at the head of boat navigation on the Po, and at the junction of the Mont Cenis route with the railways of the plain of Lombardy, has iron and steel industries, and notable motor-car works. The two great ports of northern Italy, established as such in the Middle Ages and maintaining that position to-day, are Genoa and Venice. The canals of Venice are not only the home of the gondola. Deep-water channels give access to a commercial harbour with accommodation for vessels of over 20,000 tons. On the opposite side of Italy, Genoa's fine natural harbour, though backed by the Apennines, has easy access to the northern plain through the Bochetta Pass, which lies behind the town. Florence, chief town of Tuscany, is an important route centre between the Arno plain and northern Italy. It became a great trade centre at an early date, and later developed many banking interests. It was as a wealthy city that it attracted the painters, musicians, and other artists who brought it artistic fame.

Besides those already mentioned, important ports along the

west coast include Spezia and Leghorn; along the east coast, Ancona, Bari, and Taranto. Reggio, in the 'toe' of Italy, looks across Messina Strait to Sicily, where the largest ports are Palermo, Catania, and Messina.

ITALIAN COMMUNES WITH OVER 100,000 PEOPLE (1951 CENSUS)

Rome	1,695,000	Taranto	174,000
Milan	1,293,000	Padua	173,000
Naples	1,028,000	Brescia	147,000
Turin	720,000	Leghorn	146,000
Genoa	683,000	Cagliari (Sardinia)	142,000
Palermo (Sicily)	501,000	Reggio di Calabria	139,000
Florence	391,000	Ferrara	135,000
Bologna	349,000	Parma	123,000
Venice	323,000	Modena	113,000
Catania (Sicily)	300,000	Spezia	112,000
Bari	273,000	Reggio nell'Emilia	107,000
Messina (Sicily)	221,000	Bergamo	105,000
Verona	187,000		

MALTA

Malta holds a key position in the heart of the Mediterranean, 60 miles south of Sicily and three times that distance from the North African coast. A British possession since early in the nineteenth century, it won high renown by its successful resistance to enemy attacks in the Second World War, thereby gaining both the George Cross as a commemorative award, and responsible government as a political gift in accord with the constitutional aspirations of its people. Unhappily, self-government has not made Malta self-sufficient; its economy is dependent on outside aid.

The colony comprises the island of Malta (95 square miles), the neighbouring island of Gozo (26 square miles), and little Comino (one square mile)—a total area of 122 square miles, which is about one-sixth smaller than the Isle of Wight. On the other hand, the population of well over 300,000 is between three and four times that of the Isle of Wight, the average density being over 2,500 to the square mile. Little more than half the area—some 42,000 acres—is classed as productive, and this is divided into over 12,000 holdings, averaging between three and four acres apiece. Such returns as are available of post-war production are mostly estimates and show a big drop from the pre-war averages, both in acreages and still more in yields. Wheat and barley (with mixed grain) are the chief cereals, and large quantities of potatoes and grapes are grown—grapes, with a production of 4,000 tons in 1949, being back to the pre-war standard, but potatoes, with 17,000 tons, being still

much below their former average (27,000 tons). Among livestock, goats are as numerous as all the other principal animals put together. At the end of the half-century there were some 50,000 goats, 21,000 sheep, 20,000 pigs, 8,500 horses, mules, and donkeys, and 2,500 horned cattle.

Malta itself consists of a low plateau descending to a south-eastern plain. The capital, Valetta, with its great harbour and dockyard employing large numbers of the inhabitants, is on the north-east coast; with suburbs it has a population of some 60,000. Over 2,200 vessels averaging 800 tons entered the port in 1949. Various light industries are carried on, mostly on a small scale. Nothing illustrates Malta's unbalanced economy so forcibly as the trade returns. In 1949 imports were valued at over £15m.—about £50 per head of the population. Exports in 1949 were valued at just over £1m., of which re-exports accounted for over £700,000, so that Malta's own exports were only about £300,000—£1 per head of the population. Two facts have to be borne in mind. Much of Malta was devastated in the Second World War, and the United Kingdom has since made large grants in aid of rehabilitation. Also at all times the Admiralty spends large sums on the upkeep of the dockyard, and this helps to pay for excess imports; back in 1940 imports were valued at £2½m. against exports (including re-exports) of under £½m. Efforts are being made to stimulate industrial production, aided by a new power station, and to develop the fisheries industry.

BULGARIA

The People's Republic of Bulgaria was established in 1946 in place of the monarchy. Extending southward from the lower Danube (except in the Dobruja), and westward from the Black Sea coast, it is midway in size (43,000 square miles) between Ireland and England, and has a population of about 7m. A treaty of co-operation with the Soviet Union was entered into in 1948.

The country is predominantly agricultural, even though much of its surface is mountainous. The northern plains, sloping down to the Danube on the north, are broken by irregular tablelands covered by clay and loess soils over a calcareous subsoil. The general appearance is somewhat arid, but this is a great grain-growing region, producing over half the country's wheat and maize. Only in the valleys and depressions are trees and pasture found, the higher land between being windswept and open. The Balkan Mountains, forming the southern rim of the Danube plains, are generally forested, the higher slopes serving as summer pastures for sheep.

In the valleys and clearings the more hardy cereals—barley, rye, buckwheat—and potatoes are grown, varied with fruit and fine pasture land. South again, the basin of the Marica (Maritsa) is characterised by numerous isolated depressions, where cold air is apt to accumulate in winter, forming 'frost pockets,' so that the more delicate fruit trees are forced up to the slopes with a good exposure and a good air drainage. Wheat and maize, sugar-beet, tobacco, vines, and fruit are grown here, while around Kazanlik, in the tributary valley of the Tundza, are the rose gardens from which the famous perfume, attar of roses, is produced. The production of rose oil fell from $3\frac{3}{4}$ tons in 1939 to three-quarters of a ton in 1946, the area under roses falling in the same period by over one-half. The industry is now a government monopoly. The Rhodope Mountains provide hill pasture for sheep and goats in the south-west, and forested areas in the west; agriculture is limited to the valleys and upland plains.

Nearly 50 per cent. of the total area of the country is classed as cultivated, and 30 per cent. as forest land. Between a third and a half of the cultivated area is devoted to wheat and maize, the area under wheat being roughly double the area under maize. Barley, rye, and oats, in descending order, yield much smaller crops. Other cultivated products include sugar-beet, cotton, tobacco, grapes for wine, and silk-worm cocoons. Livestock numbered, in 1948, nearly 9m. sheep and goats, 2m. cattle, 1m. pigs, and half a million horses; but, for reasons stated later, there has since been wholesale slaughter, and the numbers may now be less.

Since the close of the Second World War, land has been redistributed and the size of farms limited to 50 acres. Attendant on this development, the Soviet system of collective farming has been introduced, under the direct supervision of Soviet authorities. Between 1946 and 1951 the percentage of collective farms was pushed higher and higher, and it was estimated that by 1953, 80 per cent. of the farming population would be included in the new schemes. The avowed intention is to industrialise the national economy, but owing to the speed with which this revolution has been carried out, and the opposition encountered from the peasant farmers, results have been at least temporarily chaotic; large-scale slaughter of livestock has taken place to prevent the animals falling into Soviet hands, and many of the newly introduced machines have been sabotaged.

At the end of 1947 the principle of State ownership and control was extended to industry, including private business but excluding foreign and co-operative enterprises. The railways have long been State owned, and some of the mines, but in general little progress has previously been made with industrialising the resources of the country. Bulgaria has considerable mineral wealth, notably good

coal and lignite deposits, but for the most part they are not easily accessible and development has been slow; coal production in 1951 was estimated at 6m. tons. Bauxite and salt are also mined, and deposits of copper, lead, zinc, iron, and manganese have been located. Electric power, also now in the hands of the State, is being developed, the production in 1949 amounting to 568m. kwh.

The capital, Sofia, in the far west of Bulgaria, at the northern end of the Rhodope Mountains, lies at an elevation of nearly 1,800 feet, and is subject to considerable extremes of summer heat and winter cold. It is an important route focus and the centre of a plain (ringed round by mountains), producing rose oil, tobacco, and sugar-beet. The country's principal lignite field lies to the south-east of the city. Plovdiv (Philippopolis), on the Marica; Russe, on the Danube; and Pleven are the other principal inland centres. The principal ports are Varna (renamed Stalin) and Burgas on the Black Sea. Estimated populations, to the nearest thousand, in 1947:

Sofia	.	.	.	435,000	Russe	.	.	.	53,000
Plovdiv	.	.	.	125,000	Burgas	.	.	.	44,000
Stalin (Varna)	.	.	.	78,000	Pleven	.	.	.	39,000

GREECE

Since its formation in 1830 the Greek monarchy has suffered many vicissitudes, including a period between the two World Wars when it was superseded by a republic; but so far from its chequered career having led to any diminution of the kingdom, accretions of territory have doubled the area, which now extends to 51,000 square miles (almost exactly equal to that of England), with a population at the 1951 census of 7.6m. (less than that of Greater London). Overrun by enemy troops in the Second World War, and torn by civil strife, Greece has had its internal economy so deranged that production is inclined to be less than before the war, and in the case of minerals is only a fraction of what it was. With recovery still in progress, ebbing and flowing with the fluctuations in the international situation, figures for any one year may easily give a mistaken impression of resources and prospects; and the following summary of the chief factors in Greek industry and trade is advisedly lacking in statistical precision.

Three-fourths of the kingdom is mainland, and the other quarter is made up by the numerous islands around the coasts, by Crete, and by the Dodecanese (these last having been ceded by Italy to Greece in 1947). The greater part of the country is mountainous, the only considerable plains being in the valleys of the River Salam-

vrias in Thessaly, the rivers Vardar, Struma, and Marica at the head of the Aegean Sea, and between Patras and Pyrgos on the north-west coast of the Peloponnese, the southern peninsula of Greece, which is all but cut off from the rest of the mainland by the Gulf of Corinth, the natural severance being extended artificially by the Corinth Ship Canal across the narrow connecting isthmus. Only one-fifth of the total area can be cultivated, because of the mountainous terrain, the hot dry climate, and the porous limestone which predominates in the mountainous regions; but this fifth supports over half the working population. Much of the cultivable land is poor soil, subject to erosion, inadequately fed with fertilisers, and yielding meagre crops. The dry summers favour wheat, which is by far the largest crop, both in acreage and yield, though the average yield is low. Maize, barley, and oats, in descending order, are considerable though much smaller crops; comparatively little rye is grown. All told, these food crops are quite inadequate for the national need.

As well as their food crops, most of the peasants plant a 'money' crop, chiefly the currant vine and tobacco. Tobacco is the most valuable export, providing up to half the total. It is an expensive but very profitable crop, and there have been signs that production is exceeding demand in the foreign market. Dried fruits—currants, sultanas, figs—also figure prominently in the export returns. Other exports include olive oil, wine, and sponges. The export trade is very necessary, to help pay for essential imports, which comprise not only basic raw materials and manufactures, but fuels (coal and oil), and foodstuffs (meat, wheat, and flour). Greece is far from being on a self-supporting basis, and these requirements are fully three times the value of her exports, even without reckoning capital requirements for a modest reconstruction programme. The difference is met by international aid, including dollar grants from the Economic Co-operation Administration and credits from the European Payments Union. Among reconstruction works, efforts are being concentrated on irrigation and land reclamation schemes, as the most likely to increase agricultural production; on mining for lignite (the only form of natural fuel which Greece possesses), so as to lessen the demand for imported fuel; and on the development of electric power—at present in its infancy—as a further means of alleviating the fuel problem.

Cotton is an important industrial crop, forming the basis of supply of raw material for a well-established textile industry, which has the reputation of being the best developed of its kind in the Balkans. Until the middle of the century, all the cotton grown in the country was absorbed by the local industry, but then the crop began to exceed requirements and there are possibilities of an export trade in raw cotton. Hopes are also entertained of developing an

export trade in rice, grown on salt flats in course of reclamation; there has long been a small production, which shows some signs of expansion in the urgent search for more exports to balance imports.

Livestock suffered depletion in the disturbances through which the country has passed. The most numerous are sheep and goats, roughly in the proportion of two to one, with a combined total of 10m. The summers are too hot and dry for the support of very many cattle, and they number only about two-thirds of a million.

As will have been gathered from the reference to imports, coal and oil are lacking in Greece. The country has a great variety of mineral wealth, but little development, partly due to the almost complete absence of fuels. The output of lignite is not only small in quantity but of poor quality. There are extensive deposits of iron ore containing a large proportion of iron (between a third and a half) and before the war there was a substantial output not only of this ore but of iron pyrites and raw magnesite. During the subsequent fighting the mines were badly damaged and the industry temporarily ruined. Its revival is one of the aims of the reconstruction programme—again with a special eye to the export trade; most of the production of iron ore was exported before the war. Though as yet on a small scale, there have been promising signs of increased production and export of bauxite.

Outside the cities, industrial development is small, and mainly confined to the preparation of agricultural produce (wine-making, currant drying, extraction of olive oil, &c.), and to small textile and chemical works. The larger industries are almost entirely concentrated in the Athens area, the capital having grown up where the north-south land routes crowd together to cross the Isthmus of Corinth into the Peloponnese. New works now in hand are giving the city an adequate water supply for the first time; for many years strict rationing of the available supplies has been enforced. Piræus, the port for Athens, is the principal outlet for the country's trade, and has a number of industries concerned with food preparation, engineering, and textiles. It includes a fiscal Free Zone of 45 acres.

Thessaloniki, better known as Salonika, at the head of the gulf of that name, is the port for northern Greece and the terminus of routes from Central and Eastern Europe *via* the Vardar valley. There is a Free Zone of over 55 acres, and also a smaller Yugoslav Free Zone—important in connection with efforts to develop trade between Greece and its big northern neighbour. Other ports include Patras, near the entrance to the Gulf of Corinth, which exports most of the currant crop; Volos, on the east coast; Kavalla, at the head of the Ægean Sea; and Corfu, on the island of that name, off the north-west coast. The once famous Corinth has long been in ruins, after repeated earthquakes. The modern town is between

three and four miles to the north-east and about two miles from the western end of the Corinth Canal; it is quite small. The canal is nearly four miles long, has a surface width of 80 feet, and is navigable by vessels drawing up to 26 feet. It was wrecked during the Second World War but has since been rebuilt and reopened. Greece also suffered heavy losses in her large merchant fleet. Owing to the difficult country much of her foreign trade has always been carried by sea rather than by rail—in normal times over 90 per cent. of the total trade goes this way. Nearly three-quarters of the 1939 tonnage was lost, but these losses have been largely restored.

Crete. Situated to the south-east of the mainland, some 200 miles from Piræus, Crete is a long narrow island lying east-west, with a mountain chain stretching its entire length. Its area is about 3,250 square miles (nearly half the size of Wales) and it has a population approaching half a million. Agricultural and pastoral industry is the economic mainstay of the island, which raises fruits, olives, and grain, and provides pasture for sheep and goats. There are three principal harbours, all on the north coast—Canea, Heraklion (formerly Candia), and Rethymno. The south coast is steep and harbourless.

The Dodecanese ('Twelve Islands'), situated off the south-west coast of Asia Minor, came under Greek influence and were so named in the ninth century A.D. Later they came under Turkish rule, passed to the Italians in their war with Turkey in 1912, and to Greece (the population being largely Greek) after the Second World War. In modern usage the term includes fourteen islands, the largest and most important being Rhodes, not one of the original twelve, but famous in the Ægean from even earlier days (the Colossus of Rhodes was one of the seven wonders of the ancient world), and afterwards the home of the Knights of St. John of Jerusalem.

All told, the islands cover over 1,000 square miles and have a population of over 120,000. They are subject to earthquakes. Next to Rhodes, the most important are Leros (used by the Italians as a naval base), and Cos. They embrace fertile tracts, intensively cultivated, and produce for export fruit and vegetables, grain and wine, cotton and silk. Two of the islands, Kelimnos and Symi, are centres of the sponge-fishing industry in the eastern Mediterranean.

Athens is the outstanding city of Greece in population as in age-long fame. At the 1951 census, Greater Athens had 1,368,000 inhabitants, including Piræus (185,000), while the populations of the next largest towns were:

Thessalonki	216,838	Volos	51,134
Patras	88,414	Larissa (Thessaly)	43,163
Heraklion (Crete)	54,541	Kavalla	42,250

ALBANIA

The Republic of Albania—declared as such in 1946 after the formal deposition, *in absentia*, of the King, who had fled the country in 1939, when it was occupied by Italy—comprises over 11,000 square miles, mostly of wild mountainous land on the eastern shore of the Adriatic—an area about half as large again as that of Wales. The population of rather more than a million—half that of Wales—is mainly engaged in agriculture and animal husbandry, especially the latter. Field crops, forming about 6 per cent. of the total area, are limited to the coastal plains. About the same area is devoted to other forms of cultivation, and cattle and sheep grazing account for a further 30 per cent., leaving well over half the total area covered either with forests or with swamps and other waste land. It was estimated after the Second World War that the livestock in the country included 1½m. sheep, over three-quarters of a million goats, and a third of a million cattle. The principal crops are maize and wheat, with tobacco and olives. An annual wool clip of some 2,200 tons of greasy wool is made up into coarse cloth for export.

There is considerable mineral wealth, though little development had taken place up to the Second World War. Copper, bitumen, and salt are worked; oil wells, principally at Kosova, produce enough for Albania's own needs, and in the past have yielded a surplus for export. Industrial activity is very slight, but development under Cominform supervision is reported to be taking place, and the start of work on the first hydro-electric power plant was announced in 1947. Very little post-war information and no up-to-date statistics are available. Both the United Kingdom and the United States have broken off relations with the government.

The capital is Tirana, in the heart of the republic. There are four ports, Durrës (Durazzo), Vlonë (Valona), Sarandë (Porto Edda), and Shengjiin (San Giovanni de Medua). Only Durrës has been given any modern equipment. A railway from that port to Elbasan was begun by the Italians in 1940.

EASTERN EUROPE

The Tsarist throne of the Russian Empire was overthrown by revolution before the end of the First World War. The marginal, non-Russian areas declared independence or joined neighbouring States, whereas the Russian core of the European part of the former Empire emerged as a communistic State. It took two years to master Siberia and Turkistan, hostile to the new régime. The national republics of the Caucasus and the Ukraine, although resisting the Russian communistic role, were not strong enough to defend their independence. The new Soviet State signed treaties of peace with their western neighbours who were recognised as independent: Finland, Estonia, Latvia, Lithuania, and Poland. Bessarabia joined Roumania.

In the years which followed the hold of Moscow over such smaller units as Georgia and Azerbaijan became stronger as the Union of Soviet Socialist Republics developed its successive five-year plans for the economic advancement of the whole. Then came the Second World War with a temporary pact between Germany and the U.S.S.R., dividing the erstwhile Poland between them. The Baltic States, parts of Finland and Poland, Bessarabia and part of Bukovina were incorporated in the Soviet Union, which extended its influence and control to the Central European States, called since 'satellites.' Because the U.S.S.R. adopted for her own nationals and her satellite States a policy of isolation from the rest of the world, it has become common to refer to the Iron Curtain and the countries behind the curtain.

THE BALTIC STATES

Along the east coast of the Baltic Sea south of the Gulf of Finland are the three small republics which became independent after the First World War, only to be absorbed into the U.S.S.R. during the Second World War.

Estonia had long been a buffer State between Sweden and Russia. In its physical features it is part of the great Russian plain, and agriculture and dairy farming are the chief occupations of the

1·3m. people that inhabit its 18,000 square miles. Tallinn, or Reval, is its chief town.

Latvia was larger than Estonia and about the same size as the Irish Republic. The population of Latvia reaches about 2m. Again, it is mainly an agricultural country with those crops which characterise the northern part of the great Russian plain, such as oats and rye, with smaller quantities of barley, potatoes, and flax. The forests which cover parts of the country gave exports of timber. The output of flax is very important, and was a leading export, though butter was also significant. The capital, Riga, an important town, at the head of the Gulf of Riga, was a natural outlet for much of Russia; it was really the frontier town between Western Europe and Russia, in that it was here that the railways changed from the standard gauge of Western Europe to the broad gauge of Russia.

Lithuania lies to the south of Latvia and agrees with it in its general characteristics and in its produce. After the First World War Lithuania was allotted a tiny strip of coast only, but afterwards detached from Germany what is the natural outlet of the country, the Lithuanian-speaking port of Memel.

U.S.S.R.¹

During the hundred years which preceded the First World War the Russian Empire had steadily expanded from Europe right across the north of Asia to the Pacific coast, and southwards to the mountainous borders of Afghanistan and Persia, so as to include what is now Soviet Turkistan. In October 1917 came the Bolshevik Revolution after the overthrow of the Tsarist régime; in the subsequent settlement Finland became independent, the three small Baltic States of Estonia, Latvia, and Lithuania were carved out of what was formerly the Russian Empire and a further tract of country on the western margin became part of the new State of Poland. But there remained an area of over 8½m. square miles with a population approaching 170m. With the frontier adjustments which followed the Second World War—including the absorption of a strip of Finland, the whole of Estonia, Latvia, and Lithuania as well as large sections of Poland and Roumania, the area was increased to over 8½m. square miles with a population which was

¹ We are greatly indebted to Professor Bogdan Zaborski of McGill University for his careful revision of this section. In accordance with his suggestion we have used the term Soviet Union or U.S.S.R. (Union of Soviet Socialist Republics) where the reference is to the whole area and have restricted the adjective Russian to the Russian Soviet Federal Socialist Republic, which comprises three-quarters of the whole.



THE WESTWARD ADVANCE OF RUSSIA, 1930-1950.

given in 1941 as 193m. and may be confidently regarded as exceeding 210m. by 1954. Like the continental United States, the U.S.S.R. is a continuous mass of land, but has an area three times as large; over 5,000 miles from east to west, and in places nearly 3,000 miles from the borders of the Arctic Ocean in the north to the southern frontier. The Union stretches from west to east over more than 170 degrees of longitude and from north to south through more than 45 degrees of latitude, which is half the distance between the Pole and the Equator. It is ten days' continuous journey in one train from Moscow to Vladivostok; it is three days' continuous journey from Moscow to the southern frontier, and nearly two days' journey from Moscow to the northern shores. There are no overseas possessions, so that, vast as is the area of the Union of Soviet Socialist Republics, the commercial geography as a whole is comparatively simple.

If we look at the position of the Soviet Union on the globe we notice at once that not only is the whole in the Northern Hemisphere, but even the southernmost part does not reach the Tropics. The U.S.S.R. lies entirely in mid-latitudes in the so-called Temperate Zone and in the Arctic Zone; no part of the country is tropical. Soviet Central Asia, it is true, has extremely hot summers, and given irrigation can grow tropical and sub-tropical crops; hence the great importance of this area to the country as a whole. Because it does not possess land in equatorial or tropical latitudes one might say that the U.S.S.R. could never be economically self-sufficient; on the other hand, with its enormous home resources, its enormous compact mass of land and the nature of its frontiers, which do not encourage foreign trade, the Soviet Union is peculiarly designed to be by nature a self-contained unit.

On the north it is bounded by the Arctic Ocean, along which it has a very long coast-line, but nearly all this is ice-bound in the winter and a sea passage along the northern coast is only possible for two or three weeks in the middle of summer, if at all. Similarly, the very remote Pacific coast of the Soviet Union, in the Far East, is ice-bound in winter. Across Asia the Soviet Union borders Manchuria, the desert wastes of Mongolia and the heart of Asia with their ramparts of mountains. In the south the Soviet Union is bounded by the mountain rampart of Afghanistan, Persia, and Turkey; its coast-line along the Black Sea is valuable, but this is an inland sea, the entrance to which is controlled by Turkey at the Bosphorus and the Dardanelles. On the west the Soviet Union is bordered by Roumania, Czechoslovakia, and Poland. Since the absorption of Estonia, Latvia and Lithuania it has a long coast-line along the Baltic but this is, of course, only an enclosed sea. Curiously enough, it is only in the extreme north-western corner of this vast country, in the Arctic coast near Murmansk—now in direct

railway connection with Leningrad and Moscow—that the Soviet Union has direct outlet to an ocean open throughout the year.

Physical features. In the broadest possible way nearly the whole of the Soviet Union is one vast, incredibly extensive plain; only in the far north-east, or as one approaches the mountainous south-eastern and southern borders, does this cease to be true. Although the scenery changes from boggy Arctic wastes through great forests of firs and other conifers to the rolling grain lands and then to the sandy uninhabited deserts, a journey in almost any direction across the Soviet Union can scarcely be described as other than monotonous. The country, however, falls into the following major divisions:

(a) *The East European Plain* or the Russian Platform, occupying practically the whole of European U.S.S.R. from the Arctic Ocean to the Black Sea, to the Caucasus and the Caspian Sea. Two-thirds of this great area lie within the basin of the River Volga, which is the longest river in Europe yet with its source in the Valdai Hills, only a few hundred feet above sea-level—to be precise less than 750 feet.

(b) *The Caucasus and Trans-Caucasia.* In the southern part of East Europe, stretching as a rampart between the Black and the Caspian Seas, is the great line of the Caucasus Mountains, rising in places to over 10,000 feet and in Elbrus to 18,470 feet. The Caucasus form such a barrier that they are still uncrossed by railway and only crossed by one motor road. The two railways find their way round either end of the mountain chain. The three small countries of Georgia, Armenia, and Azerbaijan (Azerbaydzhan) lie beyond the Caucasus (Trans-Caucasia) and are now separate socialist republics within the Union. A western extension of the Caucasus Mountains passes through the mountainous peninsula of the Crimea.

(c) *The West Siberian Lowlands.* This tract of very low, flat country, with large areas liable to spring floods, which forms the western part of Siberia is separated from Russia in Europe only by the low rise of the Urals, which can scarcely be called the Ural 'Mountains' and offer little or no barrier to communications, though the highest points do exceed 5,000 feet.

(d) *Eastern Siberia*, east of the River Lena, is on the whole a low plateau.

(e) *The Far East*, a very remote region of the U.S.S.R., differs from the remainder in that it consists of a succession of mountain chains, some of them still scarcely explored.

(f) *Soviet Central Asia*, east of the Caspian Sea, consists on the whole of a great desert basin, the Turanian basin, bordered by mountains on the south and east, amongst which are well-watered and populous valleys, and rising in the north to a low, undulating steppeland which separates Soviet Central Asia from Siberia.

Such a land of extensive rolling plains is naturally a land of

large, slow, meandering rivers; but the Soviet Union is not very fortunate with regard to its rivers. Siberia is drained almost entirely to the Arctic Ocean in the north by the Ob, the Yenisei, and the Lena, and only in the far east do the Amur and its tributaries flow to the open Pacific; thus the Siberian rivers lead to the frozen Arctic and their lower courses are frozen for many months of the year. Similarly in the northern part of European Russia, the Petchora and the Dwina drain to the Arctic. Soviet Central Asia is a land of inland drainage, and so too is all that huge territory drained by the Volga into the Caspian Sea. Those valuable rivers the Don and the Dnieper drain to the Black Sea, and so does the Dniester, formerly the boundary between the Ukraine and Roumania. The River Western Dwina passes through Latvia before reaching the Baltic Sea. Despite the fact that they are all frozen for many months of the year, the Soviet Union is making considerable use of her rivers, and reference will be made to the waterways in a later section.

From the point of view of railway and road construction, the rivers form the principal obstructions to through communication across this great plain and necessitate numerous and very large bridges.

Minerals. The Soviet Union vies with the United States in the richness and variety of its mineral resources.

The Russian Platform or the Plain of East Europe consists of an underlying block of very ancient rocks which has resisted later earth-building or mountain-building movements, and instead has been subjected to movements of elevation and depression. In times of depression it has been covered by the sea or by large bodies of fresh water which have left on its surface deposits to-day remaining as horizontal beds or beds but very slightly folded. In places, particularly along the north, the ancient rocks of the underlying block crop out, but over the central and southern regions they are covered by the later deposits. Fortunately the later deposits include in places coal-fields, so that the European part of the Soviet Union has three great coal basins. There is one in the extreme north-east in the Arctic region—the Petchora Field, now worked in Vorkuta; there is one consisting of brown coal lying to the south of Moscow and known as the Moscow or Tula basin; the third, and by far the most important, is the one known as the Don or the Donetz basin in the south, not far from the Black Sea. Associated with the very ancient rocks which are exposed in the north, are the minerals now being exploited in the Kola peninsula—iron, nickel, and apatite from which phosphates for manure are made. In the south, at Krivoi Rog near the Black Sea, there are enormous deposits of iron ore, so that U.S.S.R. ranks second to the United States in its production of iron and steel. The whole of the northern part of European

Russia was covered during the Ice Age by a great ice-sheet which, on melting, was found to have left a hummocky drift-covered surface. Some of the hollows are now occupied by lakes, others by marshy tracts or bogs, some of which are yielding peat. Farther south ridges of sand, gravel, and boulders run across the country and mark successive stages in the retreat of the ice-sheet and are actually terminal moraines. Beyond this, over central and southern Russia and the Ukraine, are vast tracts which are covered by wind-borne deposits laid down by the very cold winds of the glacial period and which are the dust-like loess. It is because of the existence of this fertile soil that so much is extremely fertile as agricultural land.

The *Caucasus* is a typical folded mountain chain, with old rocks exposed in the centre yielding their quota of metallic minerals, including lead and zinc in the north, iron, manganese, copper, and aluminium on the southern flanks. Similar minerals are yielded along the southern border of Trans-Caucasia. On the flanks of the Caucasus are the famous oil-fields—the most important are to the south of the mountains, around the eastern end, near Baku, but another field is also worked near Tiflis. A very important field on the northern flanks is Grozny, and there are other wells near Maikop. The Soviet Union probably ranks third among the world producers of oil, following the United States and Venezuela (p. 266).

Although the *Urals*, topographically, only form a low divide, the old rocks are brought to the surface and the tract in the centre is a highly mineralised one. Amongst the many deposits of iron ore the most remarkable is the enormous Magnet Mountain, near which the Russians in the inter-war years built the great iron and steel town of Magnitogorsk. Other mineral deposits in the Urals include those of copper, chromium, manganese, nickel, gold, platinum and bauxite. Just as on the flanks of the Caucasus there occur the great oil-fields of southern Russia, so it seems from recent discoveries that a line of oil-fields exists on the flanks of the Urals, and oil has now been discovered at intervals almost from the Arctic Ocean to the Caspian Sea, though the exploitation is still small. On the Siberian flank there is an important coal-field, whilst in the north a recent discovery has been one of the largest deposits of potash salts yet known in the world. Ordinary salt is important in the area below sea-level north of the Caspian Sea (and also in the Crimea) and is obtained from brine-lakes.

The *Plain of West Siberia* is essentially a low-lying area, formerly a gulf of the sea, now filled up with partly marine and partly land deposits, of the type which cannot be expected to yield any minerals. On the south-eastern margin of this area, however, is the great coal-field of the Kuznetzk basin, now in course of development as an industrial region.

The plateau of *Central Siberia*, averaging some 2,000 feet in height, consists of a great mass of ancient rock. In places, at least, these ancient rocks are known to yield metallic minerals—there are the famous gold deposits of the Lena basin and many other metallic minerals are believed to occur. On the flanks of the old plateau and covering part of the surface, coal-fields with almost horizontal seams are known to exist; still largely unexplored, there is the Tungus coal basin on the west, the Lena basin on the east. Better known are the fields on the south, the Minusinsk basin and the Irkutsk basin and the Kansk basin, all of which have large reserves of coal.

The Far North-east may be described as still an unknown area. Structurally it is complicated, and it is possible that it may yield important mineral deposits. Gold is known in several places, whilst in the south there are two coal basins; in the island of Sakhalin and in Kamchatka there is oil.

Soviet Central Asia, consisting as it does of a central plain with a surround of complex, highly folded mountains, is proving, as one might expect, an important mineral-bearing area. There are coal basins (including the large Karaganda basin), oil may occur along the southern flanks, whilst in the ancient rocks there are gold, copper, lead, tin, and zinc.

Although their claims may be regarded as optimistic, it is certain that the U.S.S.R. has enormous reserves of minerals. A recent estimate suggests that the known reserves include half the world's iron ore, a fifth of the world's oil, 15 per cent. of the world's coal, copper, and zinc, three-quarters of the world's manganese, and a quarter of the world's water-power. It is claimed now also that the production of gold rivals that of South Africa, the world's largest producer.

Climate. The Soviet Union constitutes the heart of the enormous land mass of Eurasia. This fact supplies the key to the climatic conditions. The enormous land area becomes intensely cold in the winter, so that the coldest known spot of the earth's surface is in the heart of Soviet Asia; there the lowest temperatures recorded on the earth's surface have been found, *e.g.* -93° F. at Verkhoyansk. Extremely severe winter conditions are found everywhere in the north and centre, improving slightly as one goes towards the south and particularly towards the south-west in Europe; even so, nearly all parts of the country have an average temperature below freezing-point for the month of January. Not a single square mile is as fortunate climatically in this respect as the whole of the British Isles; only Trans-Caucasia and the Iran-Afghan borders have temperatures above 32° F. in January.

In summer, on the other hand, the whole of the enormous land mass becomes intensely hot; temperatures of over 90° F. are sometimes recorded even within the Arctic Circle. The deserts of Soviet

Central Asia suffer the most intense heat, but the whole country may be described as hot. Only the Arctic coast-lands have cool summers.

In winter the great mass of cold, heavy air which rests over the whole area results in a high-pressure centre from which there are out-blowing winds. Contrary to popular belief the snowfall in winter is comparatively light, rarely exceeding three feet. It is in the spring when the high-pressure area gives place to a low-pressure area that in-blowing winds from the ocean bring their quota of rainfall. Most parts of European Russia and the fertile belt of Siberia thus enjoy light, spring rains ideal for grain, followed by the heat of summer. The south-west is the region in which both temperature and precipitation are most favourable to production. Eastwards, around the Caspian Sea and in Soviet Central Asia the rainfall drops below eight inches and desert conditions prevail.

Soils and natural vegetation. The Russians have been pioneers in the great science of the study of the soil. They realised that the formation of soil does not depend so much upon the character of the underlying rock as on the character of the climate. The great soil belts of the country correspond with climatic conditions and run across the country from east to west, and really constitute the great natural regions of the country.

(a) *The Tundra Belt and the Tundra Soils.* Here the cold in winter is such that the subsoil is permanently frozen; the heat of summer is insufficient to do more than melt the moisture in the surface layers, with the result that in summer the surface of the ground is swampy and the soils boggy. We are here beyond the northern limits of the growth of trees and the ground is covered with tundra vegetation, of mosses and lichens, including the famous reindeer moss, though for a short period there may be rich growth of grass and flowering plants.

(b) *The Belt of Coniferous or Softwood Forests,* with podsol (ash-coloured) soils. Russia has by far the largest reserves of untouched forest lands of soft timber in the world, and the coniferous forest stretches as an enormous belt from the Finnish border right across the country to the Pacific Ocean, as far south, roughly, as the latitude of Leningrad. The great difficulty is one of access to the forests. Only the more accessible parts have been seriously worked so far. Unfortunately for Russia, the rivers which can be used for floating timber, at least for a few months in the summer, drain towards the Arctic Ocean. There has been a great increase in the exploitation of timber, even in the more distant forests, and the timber 'ship caravans' of the Arctic Ocean are now piloted by ice-breakers and by aeroplanes which study the weather conditions. Before the First World War the amount of timber transported increased from 9.9m. tons to about 13.25m, in 1908, and the chief

timber markets then were Leningrad, Kronstadt, Moscow, Archangel, and Riga. Later the exportation greatly increased, but the total cut only represents a few per cent. of the annual increment by natural growth. The Arctic coast has become increasingly important. The soils of the forest are light ashen in colour, hence the Russian name podsol, and they are poor in plant food. Thus when the forest is cleared they are not very valuable for agriculture even when the climate would permit agricultural development. There are also large stretches of boggy soil and tracts of peat.

(c) *The Deciduous or Mixed Forest Belt of European Russia and the Ukraine* consists partly of coniferous trees and partly of deciduous trees which lose their leaves in winter. Here the soils are rather better and much of the land has been cleared.

(d) *The Black Earth Belt.* The natural vegetation of this belt was a rich grassland with scattered trees. The soil consists of loess very dark in colour because of the large quantity of vegetable matter, and is a soil which is extremely fertile. As a result this is the great grain-growing belt of southern Russia, the Ukraine, and Siberia, and most of the natural vegetation has been replaced by vast fields of grain.

(e) *The Chestnut-brown Soils and the Steppelands.* This is land formerly covered with grass rather poorer than in the belt just described, and where the soils, though good, are not quite so rich. This to-day is also a grain-growing region, but not of the same remarkable fertility as the Black Earth Belt.

(f) *The Grey Desert Soils and the Saline Soils* are those characteristic of the drier regions of the Soviet Union around the Caspian Sea and of Soviet Central Asia. Here in some areas there is very poor grassland formerly inhabited by nomadic stock rearers with their flocks and herds. In the drier parts little grows, and settlement is only possible where water is available for irrigation. This is, however, an important part of the Soviet Union because it is the warmest, and here, on irrigated land, tropical and sub-tropical crops can be grown.

(g) *The Mediterranean Zone.* Along the southern border of the Crimean Peninsula there is a very small, sheltered tract of land where the U.S.S.R. can grow some, at least, of the Mediterranean products.

(h) *The Subtropical Zone* is the hot wet lowland of western Trans-Caucasia where rice, tea and citrus fruits are grown.

Animal life. The grasslands and the steppes of the Soviet Union have been conquered and settled by man, but the great forest stretches to the north, to a large extent, have not. They are still the haunt of numerous wild animals, important because they are fur-bearing animals, and before the days of the Iron Curtain Russia thus provided a third of all the furs which entered into international trade. Some, such as the Russian sable, are now

rare, and Russia is paying attention to the breeding of fur-bearing animals such as the silver fox. Attempts are being made to utilise the wild animals of the north, particularly the reindeer, for the supply of milk, meat, and other produce.

There are some fisheries along the northern coast and a few in the Far East, but more important and more famous are the river fisheries, especially of the River Volga for sturgeon, the roes of which yield that famous commodity, caviare.

The people of the Soviet Union. The Soviet Union stretches from Europe right across Asia. In the same way the people are essentially Euro-Asiatic. Much of the failure of Western Europe and America to appreciate the true state of affairs in the Soviet Union to-day is due to a fundamental lack of understanding of the peoples of the Union. In the first place they are extraordinarily varied and include many different racial stocks; nearly three-quarters of the whole are Slavs. About A.D. 1230 the Mongolians overran Rus (which term covers Russia and the Ukraine in medieval times). For nearly 250 years Rus remained a tribute-paying vassal of the Mongolian State known as Orda and the defence of Western Europe against the Mongols and Turks fell to Poland and Hungary.

Various Turkic and other tribes are to-day the principal inhabitants of Central Asia; they penetrated there and to the Volga basin in medieval times where they remain in considerable colonies. It was Poland and Austria who protected the rest of Europe from these invasions and we may almost say that the material progress of Western Europe for some five or six centuries was made possible by this protection. Russia's activity against Turkey was strong and successful in the eighteenth and nineteenth centuries. In wars against the Ottoman Empire the southern Ukraine, Crimea, and Trans-Caucasia were captured.

The militaristic and imperialistic organisation which persisted until the Revolution of 1917 was very largely the result of the long history of strife. A great gulf separated the peasants from the ruling classes. The much misunderstood Cossacks were the Ukrainians and Russians who were liable to military service and in return received arms and money grants from the government and also a reservation of considerable stretches of land; they might be described as mercenaries, who were employed as the advance guard of colonisation or conquest and as the militaristic police force throughout the country. There were serfs—and serfdom was not abolished until 1861, and even after that it was quite common for slaves to be sold in the Far Eastern markets. Down to 1861 the majority of the peasants were serfs attached to the properties of landowners. In that year they were emancipated in a sense, and portions of the landowners' estates were set apart for them, the government paying compensation which was to be repaid

by the peasants by instalments. For this repayment, however, not the individual peasants but the *mir* or village commune was made responsible, and the *mir* as a whole had control of the peasants' land. The land was allotted to individuals in scattered parcels so as to give all an equal chance of getting land of equal quality on the whole, and redivisions of the land took place at intervals of years varying in length in different parts of the country. No member of the *mir* was allowed to leave it at his own free will. By a law of 1906, however, the peasant was made really a free man. He could demand his share of the land in one piece, and buy out his neighbour if opportunity offered. Greater agricultural enterprise was being shown by the more capable. Improved agricultural machinery and implements were being more largely bought and improved methods of farming likewise being adopted. On the other hand, peasants whose holdings were too small were selling them and becoming labourers. Ultimately these would have been absorbed no doubt by the demands of manufacturing industry. The congestion in the agricultural districts where the land was excessively sub-divided was being relieved to some extent by migration to the more thinly peopled tracts in the south-east as well as to Siberia. Formerly emigration to Siberia was allowed only to villagers, but emigration thither from the towns was permitted from the beginning of 1914. The heart of Slav Russia was Moscow, but feudalistic Russia, as far as the ruling class was concerned, appreciated the civilisation of western Europe and Tsar Peter the Great in 1700 established its capital at St. Petersburg, now Leningrad, where communication by sea with western Europe was possible. Imperialist Russia had designs on the conquest of much of Asia, and looked upon the Far Eastern coast with Vladivostok and Manchuria as their ultimate outpost in that direction. The first Russian conquest beyond the Urals was made in 1581 under a Cossack leader called Yermak. The expedition was primarily in the interest of a family of Russian fur-traders, but it received the sanction of the Russian Government, and politically was merely a continuation of the process of expansion by which the grand princes of Moscow gradually drove back or subjugated the Tartar invaders of the thirteenth century. The immediate result of the first invasion of Yermak was the fall of the Tatar capital, *Sibir* on the Irtysh, about ten miles above the present Tobolsk, which was founded soon after. Small parties of Cossacks, living the life of backwoodsmen, gradually pushed eastwards along the rivers, and in little more than fifty years after the conquest of *Sibir* a blockhouse was erected (1632) on the present site of Yakutsk on the Lena. Before the close of that century the Russians had come in contact with the Chinese on the Amur, but a pause of about 150 years took place in their eastern expansion, after they had in 1689, in the Treaty of Nerchinsk, relinquished all claim to

the Amur. Further expansion in this direction took place during the Crimean War, and in 1858 the Chinese agreed in the Treaty of Aigun to recognise the Amur and Usuri and a line drawn from the head of the Usuri southwards to Korea as the Russian frontier. In the latter part of the nineteenth century the frontier was pushed farther and farther so as to include what is now Soviet Central Asia, and with the completion of the Trans-Siberian railway in 1903 Moscow was placed in direct communication with its Far Eastern possessions. But the prestige of the country received a severe setback on its defeat in the Russo-Japanese War of 1904-05. In the early nineteenth century Siberia was virtually an uninhabited tract, despite the inherent fertility of much of its area. Its severe winters gained it a notoriety which was heightened by its use as a place of exile for criminals. But all who resisted the existing régime were also liable to exile; many of the most progressive elements of the country who resisted political intolerance preferred to make their way to a new country and so went to Siberia as voluntary exiles. The virility of these political exiles was largely responsible for the amazing growth of settlement, agriculture, and urban life in Siberia, where the rapid growth of such centres as Novo-Sibirsk from about 5,000 in 1897 to well on for a million in little over half a century suggests a comparison with the pioneers who for the same reasons set out to conquer the Middle West of America.

In the twentieth century the organisation of Russia was an anachronism. In 1917 the mode of life and the standard of living of the bulk of the Russian peasants was not very different from that of the agricultural peasants of England in the Middle Ages. In assessing the results of the Bolshevik régime this must be borne in mind: the immense difficulty of conquering the inherent conservatism of the people and of educating vast numbers even to a state of literacy must be remembered. But cut off from the rest of the world and incessantly bombarded by propaganda, education has come to have a curious meaning. According to the present constitution, private property in land is abolished, all land, forests, mines, waters, livestock, factories, railways, &c., are State owned. The unit of government is the Soviet of Workers', Soldiers' and Peasants' Deputies, each constituent state of the Union being governed largely by its own Central Executive Committee and Council of People's Commissaries; subject in turn to the Union Central Executive Committee and Union Council. Under the intensive programme of development of the successive Five Year Plans there was undoubted material progress in all directions in the Soviet Union, but on the eve of the Second World War the standard of living was not in many respects comparable with that which normally exists in Western Europe.

The distribution of population. In 1939 the population of the

Soviet Union was nearly 170·5m.: at the census taken in 1897, the population of the same area was only a little over 106m. Within the extended post-war limits of the U.S.S.R. (see p. 493), the population in 1950, as estimated in publications of the United Nations, numbered 203m. Although Moscow has a population of 4·5m. and Leningrad of 3·4m., and there are 115 towns with a population of over 100,000, more than half the total population of the Soviet Union may still be described as rural. We find that this rural population is densest along the famous Black Earth belt stretching from the borders of Roumania across the Urals into Siberia. Along this belt, too, are the great towns of Siberia such as Omsk, Novo-Sibirsk, and Tomsk. To the north and south of this population tends to decrease, but with large urban nuclei in the industrial regions which will be described later.

Occupations of the people. Imperial Russia was essentially an agricultural country with a limited development of industry concentrated almost entirely in two regions:

- i. The immediate neighbourhood of Leningrad; and
- ii. The central tract with its centre at Moscow, together with outlying industrial regions on the Don coal-field in the south and associated with oil in the neighbourhood of Baku.

Among the great objectives of the First Five Year Plan (1928-32), the Second Five Year Plan (1933-37), and the succeeding plans, have been not only the industrialisation of the Union to make the country a self-sufficient economic unit, but also the redistribution of industry in such a way as to locate the great industrial enterprises where power (coal, oil, water-power, or peat) are available or where there is an abundant supply of raw material—particularly heavy and bulky raw material, *e.g.* iron ore—and also to utilise to the full labour resources in different parts of the country. The result has been, in the first place, to have local industries to supply local markets, a requirement very important in a country of such vast distances as the Soviet Union. In the old days raw cotton was sent 2,000 miles from Soviet Central Asia to Moscow and sent 2,000 miles back as finished cloth; this is obviously an absurdity, hence the establishment of industry in Soviet Central Asia itself for the supply of local markets.

This scattering of industry proved of immense value in the Second World War when the Germans overran European Russia as far east as the gates of Leningrad, Moscow, and Stalingrad.

Rural occupations. Thirty-four per cent. of the whole of the Union is occupied by forest, 11 per cent. by pasture, non-agricultural land 31 per cent., arable land 9 per cent., but the area of the country is so vast that this 9 per cent. of arable land represents 500m. acres. The great cultivated belt is the Black Earth belt. Here the crops are wheat—spring wheat, where the winters are too severe for autumn

sowing—and barley; on the warmer southern side of the wheat belt maize or corn becomes the main or leading crop; on the northern cooler side the place of wheat is taken by oats and rye—rye, the great bread grain of the peasantry over so much of the country, and which still occupies a larger area than any other grain. It should be noted that the yield of grain crops is still low. North of the latitude of Leningrad climate places a limit on the cultivation of many crops, and although barley takes advantage of the long summer days and will ripen within the Arctic Circle, a very important crop in these northern regions is oats.

Of the chief industrial crops, mention must be made of the cotton lands: the Union can really only grow cotton in Soviet Central Asia, and hence it has been an objective to release as much land as possible for the purpose of growing cotton; this has been achieved by improving rail communications to Central Asia, sending foodstuffs and thus releasing land. It is in the Ukraine that sugar-beet cultivation is particularly important. Farther north in European Russia flax and hemp are leading crops.

The bulk of the cultivated land is now either in collective farms or in state farms. Tracts owned by single owner peasants are limited to about 50m. acres. Thus the primitive methods of agriculture are being replaced by large-scale American methods with the accompanying use of tractors, which are being manufactured in the country itself, particularly in those large towns lying within the agricultural belt, such as Stalingrad and Kharkov. Before the First World War Russia was a leading exporter of most of these cereal crops; naturally during the War the export disappeared and it has never since been large.

Amongst animals we may notice the still extensive though falling use of horses, the cattle which are kept by the tribesmen on the drier steppelands of Soviet Asia, the dairy cows and the beef cattle which are reared on the cooler northern regions (often in clearings amongst the forests), and also the dairy cattle (for butter) of Siberia and the more fertile valleys of Soviet Central Asia. Sheep and goats, to the number of over 100m., graze on the drier pastures south of the grain belt, whilst pigs are found, as usual, more within the actual grain belt itself.

The enormous forestry resources of the Soviet Union have already been briefly indicated, and there is a large working and some export of timber *via* the northern rivers. This is particularly from European Russia at present, but the exploitation of the Siberian forests is progressing rapidly.

Industry. The industries of Russia may be described particularly in relationship to the industrial areas.

1. *The Central Region around Moscow.* In Imperial Russia, this region produced something like half of all the manufactured

goods produced in the country. To-day the importance of its output is no less, but relative to the output of the whole country it is less significant. Moscow itself is the great centre, to the south is Tula, to the north we find Kalinin, Yaroslavl, and Ivanov, whilst to the east is Gorky (strictly Gor'kiy). The whole region used to draw its coal from the far south, the Don basin; much more extensive use is now being made of the rather poor brown coal or lignite of the Moscow or Tula basin. The whole area was linked together in an electricity grid under the Second Five Year Plan. It is a region associated primarily with the cotton industry and with textiles generally and the manufacture of clothing, together with various metal workings and machinery manufacture and a chemical and miscellaneous industry. Gorky has the great automobile factory of the U.S.S.R.

2. *Leningrad.* Leningrad is an artificial industrial centre, in that it has no coal nor has it sources of iron ore. It has, however, its sea-board situation, and as an industrial centre its position has been greatly improved in recent years by the construction of hydro-electric works on two rivers in the neighbourhood. There is a shipbuilding industry specialising particularly in timber ships and ice-breakers; there is the manufacture of miscellaneous machinery, a limited textile industry, but an important clothing industry.

3. *The Ukraine-Don Region.* This area covers the fine rich Donets coal-field, also one of the great iron ore yielding regions, and in addition spreads over the very fertile Black Earth region of the Ukraine. Krivoi Rog has the largest iron ore deposit worked, and the region round the iron-field and also eastwards on the coal-field and at Rostov forms the centre of iron and steel production, and we must remember that the output for the country is over 20m. tons of pig iron per year. There are numerous secondary industries which utilise the iron and the steel, such as the manufacture of agricultural implements for use in the fertile belt by which the territory is surrounded. We have also the preparation of local agricultural material; thus there are sugar mills, flour mills, and tanning mills. Kiev, on the Dnieper, has long been the centre of Ukrainian sugar refining and has important leather manufactures.

4. *The Ural Region* is one of the newer industrial areas. The Urals have long been famous for their metallic minerals and for their great reserves of iron ore. One thousand two hundred miles to the east in Siberia is the enormous Kuznetzk coal-field, and it is in the present plan in the Soviet Union to develop industry at both ends of a line of communication between the two. So there is the huge iron and steel town of Magnitogorsk and the newer one of Orsk at the western end amongst the Urals, whereas the Kuznetzk coal-field has itself become a great centre of industry which is growing rapidly.

5. *The Kuznetzk Coal-field* may be mentioned next. To the north, at Tomsk, are wood-working industries; on the field itself are a great variety of manufactures, including textiles. Textiles are even more important at Barnaul to the south-west; and there are mills at Novo-Sibirsk. There is steady development on the coalfield itself.

6. *Other Industrial Centres.* There is the growing industrialisation of the Kola peninsula in the north associated with timber working and with metals; there is the important Trans-Caucasian industrial region around Tiflis and Baku with its enormous reserves of oil and its utilisation of some coal together with metallic minerals; there is the growing industrialisation of Central Asia (where are the old market towns such as Tashkent, Samarkand, and Kokand) in the cotton district with the object particularly of supplying the local market.

Of the output of the Union, 70 per cent. is now attributed to manufactures and the remaining 30 per cent. the produce of agriculture, almost the reverse of the position in 1913.

Other Inland Towns. Among the chief inland towns besides those already mentioned are Kazan, Kuybyshev (Samara), at the east end of a loop of the Volga, where the river is pushed eastwards by a limestone barrier, long important for its river and eastern land trade, now of importance as situated at the angle of bifurcation of the old southern route of the Trans-Siberian Railway and the line to Chkalov (Orenburg) and Turkistan; Saratov, lower down, on the Volga, a centre of the cultivation and manufacture of tobacco; Stalingrad on the Volga; Kharkov, a centre of trade and industry in the Ukraine; Kiev, capital of the Ukraine; Chkalov, on the Ural, the old starting-point of caravans to the east and south-east before the construction of the railway. In Siberia, all on the railway, are Novo-Sibirsk, Omsk, Krasnoyarsk, Irkutsk and Chita.

Before the Revolution large periodical fairs were characteristic of the inland, and even to some extent of the foreign, trade of Russia. The great fairs of Nizhniy-Novgorod (now Gorky), the most important of which was held annually in August, were international, Asia and Europe there exchanging products. The value of the goods sold at the fair sometimes amounted to about £20m. Irbit, east of the Urals, north-west of Tyumen, was the seat of fairs of great importance to the Siberian fur-trade.

Of Soviet towns formerly important but now decayed, two are mentioned elsewhere—Novgorod, once the centre of a great trade in furs and other commodities, and the old Tatar capital of Sarai. Novgorod, situated on the Volkhov just below its exit from Lake Ilmen, was for hundreds of years—till it was conquered by the Moscow Tsars in 1478—the seat of a principality which probably owed its independence, and in a large measure also its commerce, to the safety it enjoyed amid the marshes by which it was surrounded. By the Volkhov, Lake Ladoga, and the Neva it carried on an active

commerce with the Baltic long before Leningrad existed. At one time its population is estimated to have exceeded 100,000, later it dwindled to a fourth of that number. Sarai has completely passed away.

Communications. The enormous size of the Soviet Union renders the question of communications one of the utmost importance. The marshy character of a large part of the surface and the want of road-making material (both stone and wood being entirely absent throughout large areas in the south) have stood in the way of the construction of roads. For half the year the substitute for roads is, as usual in such regions, tracks formed by the repeated passage of wheeled vehicles, and apt to be rendered scarcely passable by bad weather. In winter a better substitute is found in the use of sledges. In Arctic Siberia, roads of rough shaped logs are commonly used in recent construction. The rivers form natural route-ways, but they are winding and often shallow, and frequently do not flow in the direction required by traffic.

From Kalinin (Tver), the head of steam navigation on the Volga, the direct distance from the mouth of the river is less than 900 miles, the distance by river is about 1,650 miles. Before the introduction of steam navigation, so slow was the rate of progress that it was a matter of months to accomplish the distance between Kalinin and Astrakhan, and even since steam navigation has been introduced the average rate of speed of the post and passenger steamers down-stream is only about 14 miles an hour, up-stream about $11\frac{1}{2}$ miles, so that if these rates were steadily kept up through the whole route, about five days would be consumed in the passage between these two places in descending the river, about six days in ascending. The time taken by a tug in drawing a train of cargo-boats must of course be much longer.

Further, no Soviet river-port is, on an average free from ice for more than ten months in the year. Kherson, at the mouth of the Dnieper, in the latitude of La Rochelle in France, has, on an average, only 280 days in the year ice-free; Astrakhan, in about the same latitude, only 264 days. Rybinsk, the chief grain-port of the upper Volga, has only 219 days ice-free, Leningrad 218, and Archangel, at the mouth of the Northern Dwina, only 177 days or less than half the year.

On the Dnieper, the principal waterway to the Black Sea, rocky rapids impeded the navigation for a distance of 23 miles on that part of the river which flows from north to south in the great bend which the stream makes to the east. Though artificial channels have been constructed since 1853 to avoid these rapids, navigation was little improved till the construction of the great power works under the Bolshevik régime (the Dnieprosges Dam). Rapids also impede the navigation of the Dniester and Bug, and, above Lenin-

grad, the much more important navigation of the Neva. The navigation of the Volga is liable to be obstructed by sandbanks which accumulate rapidly where any impediment occurs in the way of the current. There are other drawbacks still. The Volga, which with its tributaries affords more than 7,000 miles of inland navigation, does not furnish any direct connection with the ocean. Goods intended for the sea were landed at Stalingrad (the former Tsaritsin) at the point where the river turns south-eastwards to the Caspian, and were transferred by rail to the Don, a river that can be navigated only by steamers of very shallow draught; now a canal connects the two—reaching the Volga at Stalingrad. The Northern Dwina, a fine deep river, flows through a sparsely peopled region, but in one respect it may be regarded as all the more important on that account as a natural waterway, since only by such means was it possible to develop in such a region an export trade in timber and timber products, flax, and other commodities, such as its waters carry.

Even before the First World War many thousands of river vessels were constantly moving between the Neva and the Volga. Many of these were of more than 1,000 tons burden, but even on the larger rivers vessels of considerable size could be used only during the spring floods. Still, it was significant of the backward state of commerce in Russia generally that the total volume of traffic on the waterways remained comparatively small. The total quantity of goods transported on Russian rivers increased from 23.3 to 44.8m. tons in 1894 to 1910. Under the First and Second Five Year Plans much progress was made with canal construction. In the first place the great Baltic-White Sea Canal links Leningrad with the northern ocean; the Neva navigation is linked with that of the Volga and with Moscow. The completion of the Don-Caspian Canal was not till 1952.

Nearly 70,000 miles of inland waterways are classed as navigable: this may be compared with 77,000 miles of railway. The extent of the water communication in Russia helped to delay the laying of railways. Down to the close of the Crimean War there were only four railway lines in the country. The principal difficulties in the way of railway construction presented by the physical features have been due to the rivers, many of which have required long bridges. The ascent of the Ural Mountains is so gradual that on the older line between Molotov (formerly Perm), at the head of steamboat navigation on the Kama, and Tyumen in Siberia it is scarcely perceptible. On the southern line also the gradients are easy. This line, running from Kuybyshev by Ufa and Zlatoust, is now continued eastwards to join the Trans-Siberian Railway. Its steepest gradient is only 1 in 100, and a short tunnel hereabouts is the only tunnel on the entire route between the Baltic and Irkutsk.

A railway to the harbour of Murmansk on the Murman coast in the north-west, which is kept ice-free all the year round by warm water drifted northward by south-westerly winds, was opened during the First World War.

Despite the enormous size of the country the railway mileage is only triple that of the British Isles, and this illustrates the fact that the railway network is a very open network compared with that in western Europe. This obviously accentuates:

- (a) The importance of developing local centres of manufacture so as to avoid the enormous distances of transport of the goods; and
- (b) The importance of developing easy and rapid means of communication by means of air.

It is not surprising to find that regular air routes now cover over 140,000 miles, and that winter operation is permitted by the fitting of skis to the planes.

The old roadway into Siberia, followed by so many thousands of hapless exiles, was the trakt, but the most important means of communication in Siberia is now formed by the Trans-Siberian Railway. The first stone of the railway was laid at Vladivostok on May 19, 1891, by the Grand Duke Nicholas, afterwards Tsar Nicholas II, and the line then begun was ultimately continued northwards to Khabarovsk on the Amur. The westernmost section, Chelyabinsk to the Ob, was opened in December 1895, and the next section to Irkutsk was opened in the summer of 1898. Originally the line was intended to follow the valley of the Amur down to Khabarovsk, but the difficulties of construction in the easternmost section of this route, together with the small prospect of economic development in that region, led with the consent of China to the change of route through Manchuria. The line was continued eastwards to Sryetensk, at the head of navigation of the Shilka, but the railway to the seaboard was made to branch off at Manchuria, 177 miles by rail above Syretensk. It thence runs south-eastwards to Harbin in Manchuria, and from Harbin south to Port Arthur and Dairen, and east to Nikolskoye on the Vladivostok-Khabarovsk line. The line was completed before the end of 1902, except for a break at Lake Baikal. For some time trains were carried across Lake Baikal in large ferry-boats, but before the end of 1904 the very difficult section round the south end of Lake Baikal was completed. The total length of the railway from Chelyabinsk to Vladivostok is 3,902 miles, from Moscow by the old southern route of Kuybyshev, Ufa, Zlatoust, and Chelyabinsk to Port Arthur 5,475 miles, from Leningrad, 5,882 miles. By connections completed in 1906 Leningrad is brought by Kirov (Vyatka) (now the main line from Moscow also), Molotov, Sverdlovsk, and Chelyabinsk within a distance of about 5,500 miles from Vladivostok, 5,700

from Dairen, and 6,000 from Peking by Niu-chang and Tientsin. In recent years the whole line has been double tracked, and in 1936, with the completion of the Hankow-Canton railway, it became possible to travel from Calais to Canton by railway. In western Siberia the railway gradients are naturally easy, nowhere as far as the Ob exceeding 1 in 135. Farther east they rise to 1 in 66, and additional difficulties in the construction of the line were presented by the numerous rivers to be crossed. The Yablonoiye Mountains east of Lake Baikal are crossed at the height of about 3,400 feet, the temperature there rising in June and July to 77° F. by day and falling to 23° F. at night.

After the construction of the Trans-Siberian Railway there was a rapid immigration into Siberia from Russia, and a considerable development of trade westwards. In western Siberia the settlers were allotted free grants of forty acres of land and were exempted from taxes for three years. In 1895 the number of immigrants exceeded 100,000, and in several subsequent years it has exceeded 200,000, the great majority remaining in the western governments. In 1908 the number of immigrants exceeded 758,000, a number more than twice as great as the highest number of immigrants into Canada up to that date, but after that date there was a decline. The railway naturally attracted to it a great deal of the trade with Russia in Chinese tea and silks, and the railway also carried large quantities of Siberian furs to Europe. Locally there developed also a large trade in grain, principally wheat, animals, meat, hides, tallow, wool, and dead game, but the principal export trade was in butter. The trade in butter, carried in refrigerator cars, was developed with remarkable rapidity by the opening of the Siberian railway, and this commodity reached Europe before 1914 from much greater distances than wheat—apparently from as far east as the Minusinsk district or about 3,000 miles from the Baltic. The total quantity of Siberian butter exported in 1898 was about 2,500 tons, while in 1912-13 the amount received thence by the United Kingdom alone was about 27,000 tons. This trade was largely in British and Danish hands. Shanghai, Nagasaki, or Yokohama can be reached by this route in eighteen to twenty days from Western Europe. In 1927 the direct Riga to Vladivostok weekly service was restored, the journey occupying 10½ days. From Moscow to the Manchurian border is approximately a week, hence numerous air services.

The chief towns of Siberia show the influence of the railway. At the census of 1897 the only two with a population above 50,000 were Tomsk, capital of western, and Irkutsk, capital of eastern, Siberia. Kiakhta, on the Siberian frontier opposite the Mongolian town of Maimachin, was formerly the centre of a large caravan trade with China, importing brick-tea and exporting furs and other Siberian products. Before the First World War Siberian

towns were growing with great rapidity, especially those situated at points where navigable rivers are crossed by the Trans-Siberian Railway. At the beginning of the century Novo-Nikolaievsk was only a small collection of huts; in 1914 it had a population of 85,000. Now known as Novo-Sibirsk, it has 750,000 people. Tomsk and Yeniseisk doubled their populations between 1902 and 1912. Even more remarkable has been the recent growth. In 1926 only three Siberian towns had a population of over 100,000, by 1933 this had increased to seven—Omsk, Novo-Sibirsk, Vladivostok, Irkutsk, Tomsk, Krasnoyarsk, and Barnaul—of which the first four and the largest are all on the Trans-Siberian.

Seaports. The principal seaport on the Baltic is Leningrad, with Kronstadt. Till the middle of 1885 Kronstadt was the port of Leningrad for all large shipping, but a canal was then opened through the shallow end of the gulf to Leningrad, and from that very year the great bulk of the shipping was transferred to Leningrad, notwithstanding the deficiency of its harbour accommodation. A large proportion of the foreign trade of Russia passes through Leningrad. The harbour of Tallinn, the capital and leading port of Estonia, was also deepened and extended, and developed into a great cotton-port, importing large quantities of this material direct from the United States. Riga, the capital and chief port of Latvia but still an important outlet for Russia, is also having its accommodation for shipping improved, by the regulation of the Dūna, or Western Dwina. Former German ports are Kaliningrad (Königsberg) and Memel.

On the Black Sea the chief port is Odessa, the harbour of which being on the sea itself (east of the Dniester) is not so apt to be closed by ice as the river ports. The shipping both of the port of Nicolaev, on the Bug, and Kherson, on the Dnieper, has to cross the Ochakov Bar, which, however, has been deepened by dredging; both these ports, which were more conveniently situated than Odessa for the grain exports of south-western Russia, grew rapidly, to the prejudice of Odessa. Among the minor Black Sea ports are Kaffa, or Fyodosiya, and Kerch, the last of which had at one time a good deal of business in lightening ships before crossing the bar at the Straits of Kerch or Yenikale. The channel across this bar has been deepened and another entrance to the Sea of Azov has been made by piercing the Isthmus of Perekop at the north of the Crimea. Sevastopol after 1899 became solely a naval port. The chief ports on the Sea of Azov are Taganrog, Azov, Rostov, Osipenko (Berdiansk), and Zhdanov (Mariupol), this last being the port of the Donets coal-field. The last two ports mentioned belong to the Ukraine, the others to Russia. At the eastern end of the Black Sea, oil is received at Batum by pipe-line from Baku.

Astrakhan, the chief Caspian seaport, is the centre of the im-

portant fisheries of the Caspian Sea and the Volga (sturgeon, &c.). Important fisheries are also carried on all the year round on the Murman coast, to the north-west of the White Sea, and on the Kanin peninsula to the north-east. Murmansk is open throughout the year and has large timber exports, though many small timber ports along the northern Russian and Siberian coasts were opened during the Second Five Year Plan (1933-37). Exports from the Far East through Vladivostok are limited.

Caucasia and Trans-Caucasia. The area on opposite sides of the Caucasus is now divided into several political divisions. That on the north side includes several autonomous republics and provinces of the main Russian Soviet Republic (the R.S.F.S.R. or Russian Soviet Federal Socialist Republic). The region to the south of the range is mainly made up of three Soviet Socialist Republics—Georgia to the west with Tiflis for its capital, and the port of Poti on the Black Sea; Azerbaydzhan (Azerbaijan), mainly on the Caspian Sea, on which lies the capital, Baku, but comprising also the Nakhichevan republic to the south of the eastern portion of the present Armenia, which lies to the south of the two already mentioned, round Lake Gokcha. Its capital is Erivan. In the east the southern boundary of these republics coincides with the pre-1914 boundary of Russian Trans-Caucasia, but in the west it curves eastwards and then southwards so as to transfer Ardahan, Kars, and Sarikamish from Russia to Turkey. The richest part of this region is that which occupies the series of valleys between the chain of the Caucasus and the tablelands to the south. It is not only that part which has the climate most favourable to vegetation (a region, accordingly, of forests, vineyards, cornfields, cotton and tobacco plantations, and pastures), but also that which contains the bulk of the enormous mineral wealth of the Caucasus. Irrigation for cotton and other crops is carried on from the Kura and the Aras to the south-west of Baku.

The Armenia mentioned in the preceding paragraph is but a small remnant of the historical Armenia, the region to the north-east of Asia Minor, partly in that peninsula, mainly inhabited by a people distinct in race, language, and religion from the surrounding peoples, but greatly reduced in numbers in past decades by repeated massacres. The great bulk of their territory is now once more subject to the Turks, but a small part forms the Soviet Republic round Lake Sevan (Gokcha), a fresh-water lake, being drained at least in rainy seasons to the Araks.

Soviet Central Asia. Although Soviet Central Asia or Turkistan is an integral part of the U.S.S.R., the historical background as well as the geography, the human population as well as their economic development, are so different that some separate account is desirable. The name is given to a vast area to the south of western

Siberia extending to the Chinese, Afghan, and Persian frontiers. Since January 1895 a single customs frontier has stretched from the Caspian to Chinese Turkistan. The district which contains the headwaters of the Amu is sometimes called the Pamir Plateau, but it is, in fact, a series of lofty plateaus and ranges with peaks 23,000 feet in height, furrowed by valleys in the west, but descending on the east with remarkable abruptness to the plains of eastern Turkistan. It is a region difficult of access from all sides, and yet one across which there are commercial routes that have often attained a high degree of importance in the commerce between eastern Asia and Europe (see p. 520).

Soviet Central Asia is now divided between the five republics, each a member of the U.S.S.R., of Uzbekistan, Turkmenistan, Kirghizistan, and Tadzhikistan in Turkistan, with Kazakhstan covering the huge area of the steppes to the north. The steppes are suited only to Kazakh and other nomads. Turkistan consists in the west mainly of plains and low tablelands, mostly desert. Throughout the region, indeed, cultivation keeps for the most part to the neighbourhood of the mountains, and where carried on at a distance from the mountains it is only by the favour of rivers which have gathered volume enough in the mountainous region to reach a considerable distance into the plains. Three rivers reach large salt lakes. These are the Ili, which enters Lake Balkhash (partly salty) through a swampy delta, the Syr Daria or Jaxartes, and the Amu Daria or Oxus, which flow into the Sea of Aral. The Zeravshan, the Murghab, and the Tedzhen, on the other hand, all dry up in the sands. Cultivation is carried on where possible along the banks of these rivers and their tributaries, and where the nature of the ground admits of it large tracts are irrigated by means of their waters. The area of the Marj oasis, which uses up the water at the end of the Murghab, is about 1,700 square miles, that is, less than that of the county of Lancaster; but the actually cultivated portion of this is scarcely one-third of the whole, say, about as large an area as that of the county of Worcester.

Besides Marj (Merv), the principal oases are Khiva, fed by streams drawn from the lower Amu; Bukhara, at the end of the Zeravshan; Samarkand, higher up on the same river, so that an extension of this oasis involves a diminution of the water-supply for Bukhara; Tashkent, watered by streams on the right bank of the Syr Daria; Leninabad (Khodzhen), and Kokand, on or near the Syr Daria, higher up.

The valleys lying along the eastern mountains, the valley of the Ili, that round Lake Issyk Kul (both in Semirychensk), and the upper valley of the Syr Daria (Ferghana), are not only plentifully watered but blessed with a black soil as rich as that of the Ukraine; and in these valleys there was in the later Tsarist years a remarkable

development. Russian policy contemplated the keeping of this development entirely under Russian control. No foreign capital was to be allowed in the government, and no foreigners were allowed even to visit it without a special permit. Under the Soviet régime entry of foreigners is more strictly limited than elsewhere. Though the Syr Daria and Amu Daria still serve locally as means of carriage for the products of the region, this commercial development may be said to be entirely due to the construction of two railways. The older is the Trans-Caspian Railway, running from Krasnovodsk, on the Caspian, through the Turkoman oases at the base of the mountains in the north-east of Persia, thence by the oases of Tedzhen, Marj, Chardzhou (where the railway crosses the Amu by a bridge opened in 1891), and Bukhara, to Samarkand, and thence by Leninabad (Khodzhen) to Kokand, Margelan, and Andizhan in Ferghana. Branches, each about 200 miles long, run south from Marj to Kushka (close to the Afghan frontier), and north from the Syr Daria valley to Tashkent. In early days the working of the long desert track of this railway was greatly hindered by blown sands, but since about 1896 the sands have gradually been brought under control by promoting the growth of sand vegetation, a prominent feature in which is the *saxaul* (*Haloxylon*), a low-growing tree, which yields excellent firewood but grows very slowly. The second of the two railways referred to above is the line from Chkalov (Orenburg) running north of the Sea of Aral to Tashkent and giving direct access from Moscow to the heart of Turkistan.

The chief product which these railways serve to transport from central Asia, including northern Persia and Afghanistan, is cotton, which is cultivated throughout the region, but chiefly in the most distant province, that of Ferghana to the north of 40° N., and accordingly further north than the northern limit in the United States. The cotton is mainly produced from American seed, which began to be experimented with in 1878, and is of excellent quality. It is for the cotton of Ferghana that the Chkalov connection is of most importance. By the earlier line this cotton from Andizhan, in order to reach Moscow, had first to be carried 1,274 miles by rail to the Caspian, then across that sea to Baku, and thence 1,618, in all 2,892 miles by rail, or across to Astrakhan on the Volga, and from there by river boats. The Chkalov route from Moscow to Andizhan is only 2,382 miles in length. Under the Bolshevik régime a notable achievement has been the construction of the Turk-Sib or Turkistan-Siberian railway which, by allowing grain and timber to be sent from the Black Earth lands direct to Turkistan, releases more land there for the growing of cotton needed not only by Moscow but also by the mills now established to supply the local markets.

The foreign trade of the Soviet Union. It is very difficult to generalise at the present time regarding the foreign trade of the

Soviet Union. The Soviet Union has concentrated on the development of her home resources and the Five Year Plans of the country are concerned particularly with the industry at home and its organisation. For this purpose it was necessary to pay for the services of foreign experts in the nineteen-thirties and, to a considerable degree, to import the necessary machinery from foreign countries. For that purpose the sale of Soviet produce was essential; thus we find that in pre-1914 Russia by far the most important exports were grain and agricultural produce: between the wars foodstuffs represented only about an eighth, animal products together with fisheries and the produce of trappers, mainly furs, another eighth. Timber is important and represented over 15 per cent., and oil took a high place also. As indicative of the needs of the country more than two-thirds of all the imports of the country during that inter-war period were machinery, including electrical machinery. Imports were obtained in very large measure from Germany, Britain, and the United States. The Second World War proved the strength of the new Soviet economy. As the Germans pressed further eastwards, to the gates of Leningrad, Moscow, and Stalingrad, the newer industrial areas were able to supply the country's needs. With the end of the war and the virtual closing of the frontiers along the 'Iron Curtain' enclosing the Soviet Union and her east European satellites, the whole has become almost self-contained and foreign commerce is small as well as being State controlled.

TOWNS WITH OVER 200,000 INHABITANTS AT 1939 CENSUS

Moscow	4,137,000	Novoye Zaporozhie	289,000
Leningrad	3,191,000	Ivanov	285,000
Kiev	846,000	Archangel	281,000
Kharkov	833,000	Omsk	281,000
Baku	809,000	Ghelyabinsk	273,000
Gorky (Nizhni Novgorod)	644,000	Tula	272,000
Odessa	604,000	Molotov (Perm)	255,000
Tashkent	585,000	Astrakhan	254,000
Tblisi (Tiflis)	519,000	Ufa	246,000
Rostov-on-Don	510,000	Irkutsk	243,000
Dnieperpetrovsk	501,000	Makeyevka	24,000
Stalino (Yuzovka)	462,000	Minsk	239,000
Stalingrad (Tsaritsyn)	445,000	Alma-Ata	231,000
Sverdlovsk	426,000	Zhdarov (Mariupol)	222,000
Novo-Sibirsk	406,000	Kalinin (Tver)	216,000
Kazan	402,000	Voroshilovgrad (Lugansk)	213,000
Kuybyshev (Samara)	390,000	Vladivostok	206,000
Saratov	376,000	Krasnodar	204,000
Voronezh	327,000	Erivan	200,000
Yaroslavl	298,000		

ASIA

Asia is the largest and most populous of the continents, but not the most densely populated, in which respect, like all the other continents, it has to yield pride of place to Europe. No exact comparison is possible between Europe and Asia, because there is no hard and fast boundary between them; they merge in the Soviet Union, which constitutes more than half of Europe and more than a third of Asia. If the dividing line between the continents be taken as following broadly the course of the Ural Mountains from north to south and thence the Ural river to the Caspian Sea, Asia may be assigned an area of 16·5m. square miles and Europe 4·3m. square miles, with respective populations at the half-century of about 1,300m. (more than half the world total) and 550m. On this basis the average density of population in Asia per square mile is nearly 80 against nearly 130 in Europe. In Asia, especially, the population is very unequally distributed—extremely sparse in the north, centre, and south-west, while round the south and east coasts are some of the most densely populated areas in the world. Half a dozen countries in that region—India and Pakistan, Indonesia, Indochina, China (exclusive of Manchuria and the outer dependencies), and Japan—with an aggregate area practically the same (4½m. square miles) as that of Europe, support nearly twice as many people (over 1,000m.), or on average nearly 240 to the square mile; leaving some 300m. people spread over the remaining 12½m. square miles, an average of about 25 to the square mile.

Climate. The explanation of this difference in the distribution of the population is to be found mainly in differences of climate; and these differences, again, are due to situation and superficial configuration. The vast size and the shape of the continent necessarily have the effect of placing the central areas at a great distance from the sea, the chief source of moisture; but it is to be noted that the existence of another continent continuous with it in the west, and a third lying to the south-west, has an important bearing on the climate of Asia. The European continent receives, to the loss of Asia, the bulk of the moisture brought about by south-west winds from the North Atlantic Ocean, and the continent of Africa has a detrimental effect on the Asiatic rainfall in two ways. First, being situated in latitudes in which there is great rarefaction of the air on

the land, and consequently a strong indraught of air from the sea, it diminishes the influx of sea air into the neighbouring parts of Asia. Secondly, it prevents such sea-winds as do blow over the south-west of Asia from being as heavily charged with moisture as otherwise they would be. Hence it is that the monsoons begin, we may say, to the east of the Indus, and hence, too, that these seasonal winds are so all-important in relation to the climate and production of Asia.

The superficial configuration of the continent intensifies the contrast between south-eastern and central Asia. The Himalayas, the loftiest mountain range in the world, arrest the summer monsoons of India. North of these mountains, the tableland of Tibet, varying from about 10,000 to 18,000 feet in height, spreads out northwards to the Altyn Tagh and Nan-Shan Mountains, and on the east and south-east breaks up into numerous mountain ranges, which also help to prevent the southern monsoon from reaching the heart of the continent. Still more effectively deprived of this essential of life are the lower tablelands in the north-central part of the continent varying from about 2,200 to upwards of 4,000 feet in height, and extending to the mountains on the borders of Siberia.

Outside the monsoon region there is probably not one million square miles, or, say, only about one-tenth of this section of the continent, in which the total rainfall of the year amounts to as much as 16 inches. The areas in which that amount is exceeded lie chiefly in the parts traversed by mountains in the south-west (western Persia, Caucasia, Armenia, and Asia Minor) and in Siberia, in the middle and upper parts of the basin of the Yenisei, and in the basin of the Ob from about latitude 56° to 62°.

In the drier parts of the continent there are various proofs that at one time the climate was moister than it is at present, and in some of these districts the population was in consequence more numerous. How far such changes may be taken to indicate a more or less continuous process of desiccation is very uncertain.

Trade routes. The monsoon region in the south-east of Asia has, from the very dawn of history, been a populous and productive part of the continent, and its commodities have been all the more valued in Europe from being the products of a warmer climate, and hence of a different nature from those native to the west. Indian spices, drugs and dyes, and Chinese silks, together with precious stones, have been eagerly sought after by European merchants since the time of the Romans, and some of them found their way to the Mediterranean even in early Biblical times (Genesis, xxxvii. 25). The favourite routes by which these commodities were exchanged for European goods differed at different periods. In large part the rise and fall of empires determined the predominant direction of trade, now by way of the Red Sea and Egypt, now by

the Persian Gulf and Persia to the eastern borders of the Mediterranean, now by more northern routes and round the Caspian to the Black Sea; from China through Indian ports, or from China across the deserts of central Asia; no route ever used exclusively, but with a recurring tendency to favour the Persian Gulf and the Red Sea. For centuries, indeed, it was a case of ringing the changes on these routes and other variants, as dictated by circumstances. Then, at the end of the fifteenth century, came Vasco da Gama's revolutionary discovery of the sea-way to India, which, as the years went on, struck a devastating blow at the overland trade. Nearly four more centuries passed before, with the opening of the Suez Canal in 1869, the Red Sea again became the favoured route for traffic between Europe and Asia, this time with the addition of Australasia as a further goal. In the present century, not only have the Red Sea and the Persian Gulf both been linked by railway with the European network, but China has been placed in railway communication with northern Europe by the Trans-Siberian route. Further, valuable freight as well as passengers are now flown swiftly over routes where, in earlier ages, caravans of camels and other beasts of burden pursued their slow and toilsome way.

A notable development of the period following the Second World War was the renunciation by the Western European Powers of their sovereign rights in their Asiatic Empires, through the grant of self-government to the constituent countries, which for the most part decided to exercise their freedom as independent States within the framework of the Empires to which they were formerly subject. Britain's former Indian Empire is now composed of three States—India, defined as a republic which remains a full member of the British Commonwealth; Pakistan, a Dominion of the Commonwealth; and Burma, which was separated from India before the Second World War and afterwards elected for full independence outside the Commonwealth. Elsewhere, Ceylon has been given Dominion status within the Commonwealth. French Indo-China has become three independent States—Viet-Nam, Cambodia, and Laos—'associated with France within the French Union.' The Netherlands East Indies, with the exception of Dutch New Guinea, now rank as the Republik Indonesia Serikat—the United States of Indonesia—described as an independent State within the framework of the Netherlands Union.

While these changes were taking place in the Orient, independent States were being established in western Asia, in the territories at the eastern end of the Mediterranean, where Turkey held sway before the First World War and where Britain and France exercised mandates in between the two World Wars. Syria and Lebanon became independent States during the Second World War, and that part of Palestine colonised by Jews proclaimed itself an independent

State under the name of Israel soon after the war—in 1948 when Britain yielded up the mandate granted by the old League of Nations.

In the Far East, a Japan shorn of outlying territories emerged from the Second World War under military occupation, mainly by American troops, until 1952, when a peace treaty was signed and diplomatic relations were restored. Another major change has been the establishment of communist rule in China, in alliance with Russia, so that both these vast territories now function largely behind an 'Iron Curtain.' Practically everywhere in Asia, east and west, growing unrest and a spirit of narrow nationalism have militated against economic and commercial development, which, however, is still fundamentally based on the geographical factors that are the concern of this book. In the following pages the characteristics of all these countries, new and old, are summed up on this factual basis.

CYPRUS

The British colony of Cyprus, the third largest island in the Mediterranean, lying in the angle between Syria (60 miles to the east) and Turkey (40 miles to the north), has an area of 3,570 square miles (nearly half the size of Wales) and a civilian population of half a million. Formerly a Turkish possession, it passed by agreement under British control in 1878, the Sultan retaining nominal sovereignty. The island was formally annexed by Great Britain in 1914 on the outbreak of war with Turkey.¹ Less than one-fifth

¹ The Cyprus 'tribute,' as the annual payment due to the Sultan came to be called, is an instructive example of the British way of doing things, and as it undoubtedly affected both the economic and political development of the island after the British occupation, a few words of explanation may be given. The amount was based on the average contribution exacted by Turkey from Cyprus in the five years before 1878. It continued to be a charge on the revenues of Cyprus under British rule, but was never paid into the Turkish exchequer, Turkey being given credit for it in the service of the Ottoman debt. It was too much for Cyprus to pay on top of other demands from a British administration eager to rescue the island from the effects of Turkish neglect; and as there was strong local opposition to the 'tribute,' the practice grew up of meeting annual deficits in the Cyprus budget by grants-in-aid from the British Exchequer. In 1910, at the instance of Mr. (now Sir) Winston Churchill, who had previously visited the island when Under-Secretary for the Colonies, these balancing grants-in-aid, which encouraged expenditure in Cyprus without additional taxation, were standardised at £50,000 a year, leaving Cyprus to balance her budget after providing £42,800 towards the Turkish 'tribute.' When the island was annexed by Great Britain in 1914, it might have been expected that the 'tribute' would disappear. Instead, it continued to figure in the Cyprus accounts as 'Share of Cyprus of the Turkish Debt Charge;' and this went on till 1927 when the charge was finally abolished in return for an undertaking by Cyprus to contribute £10,000 a year to Imperial defence. In later years, vastly larger grants have been voted to Cyprus by the British Parliament under the head of Colonial Development and Welfare.

of the population are Turkish-speaking Moslems; four-fifths are Greek-speaking. Some of the latter desire union with Greece and their lack of co-operation with the government is a handicap to development, which, however, has made rapid strides since the days of Turkish administration.

Shaped like a bill-hook, with the handle extending to the north-east, the island has along the whole of the northern coast—a distance of 100 miles—a mountain range with peaks rising to 3,300 feet, and in the south-west a broader mass of mountains, culminating in Mount Troödos (Olympus) with a height of 6,406 feet—high enough to permit of winter sports and to serve as the summer seat of government. Between the two ranges stretches a great plain, the Mesaoria, given over to farming and having in the centre the capital, Nicosia. Nearly half the total area of the island is classed as arable land; the rest is divided almost equally between pastoral country, forests, and built-on or waste areas. Farming is the basis of the island's economy. Fully a third of the working population get their living from the land, and there are nearly 50,000 independent peasants or farmers. Rainfall, mostly in winter, ranges from 14 inches in the Mesaoria to 40 inches among the mountains, and is normally adequate for crops, with the aid of irrigation; but seasons vary a good deal, droughts are not uncommon, and yields fluctuate greatly. The main cereal crops are wheat (180,000 acres, yielding 40–60,000 tons) and barley (115–130,000 acres; 40–60,000 tons). Fruit and vegetables are the other main crops, grapes yielding 50,000 tons from 75,000 acres; citrus fruits 30,000 tons, mostly oranges; and potatoes 35–45,000 tons from 10–12,000 acres. Cotton, olive oil, and tobacco are other crops on a smaller and uncertain scale. There is a steady trade in carobs—the horn-like pods of the carob tree.

Because of the scorching summers, there are no good all-the-year-round pastures, and the most numerous livestock are sheep and goats, of which nearly half a million find rough grazing and supply their owners with milk and cheese. Both the goats and their owners have done extensive damage to the forests, and great efforts are being made to control their activities. While the number of sheep is around 300,000, goats tend to decline from 200,000. Camels are still found in Cyprus, though the number is down to under a thousand.

The forests, though sadly depleted, contain much valuable timber, which is now carefully conserved. A Forestry College, opened in 1951 among the pine forests of the Troödos range, is intended to be a training centre for the entire Middle East.

The mineral resources of Cyprus are of ancient renown; the name 'copper' is derived from *cyprium aes* (Cyprus metal). Since the Second World War there has been a striking revival of the mining industry in the Troödos Mountains, and its products—

chiefly cupreous pyrites, asbestos, chrome iron ore, and gypsum—have become the most valuable of the island's exports; in 1951 they accounted for about half the total value of £14m. Agricultural and pastoral industry provided most of the other exports, though several manufactures of minor value contributed to the total, including two of an unusual character—artificial teeth, which are made in millions, and buttons made from dom nuts by the hundred million. Since the war large sums have been sunk in Cyprus on Colonial Development and Welfare schemes, Imperial defence, and business investments, with the result that imports have largely exceeded exports. In 1951 they amounted to some £19m., including a considerable sum for foodstuffs, but mainly made up of manufactures, especially textiles, iron and steel goods, and machinery of all kinds.

The narrow-gauge railway which since 1905 has crossed the Mesaoria from the port of Famagusta to Nicosia was closed at the end of 1951, and Cyprus is now without railway transport. There is a good road system, comprising nearly 900 miles of main roads (of which over 700 miles are asphalted) and 1,850 miles of secondary roads. Already, before the railway was closed, Cyprus had 8,500 motor vehicles.

Development has not been confined to material progress. An intensive campaign against malaria resulted in 1949 in the complete eradication of the malaria-bearing mosquito.

Nicosia, the capital, is also the largest town; it has a population of 37,000, excluding suburbs. After it come Limassol, 25,000, on the south coast; Famagusta, 18,000, on the east coast; Larnaca, 15,000, on the south-east coast. Famagusta is the chief port, and is being steadily improved. Limassol and Larnaca are little more than open roadsteads.

TURKEY

The ancient Sultanate of Turkey, whose ruler was also Caliph, or head of the Mohammedan religion, lost much territory in the First World War and was proclaimed a republic in 1923, by vote of a National Assembly. The caliphate was abolished, Western dress introduced, the Roman alphabet adopted, and the capital removed from Stamboul or Istanbul (formerly Constantinople) to Ankara, in the heart of Asia Minor. Despite westernising influences, Turkey belongs, geographically, almost wholly to Asia. Of its present area of 300,000 square miles, only 3 per cent. (9,000 square miles) falls on the European side of the Bosphorus, the Sea of Marmara, and the Dardanelles, while 97 per cent. (291,000 square miles),

comprising the whole of Asia Minor, lies to the eastward of that inter-continental boundary.

Asiatic Turkey has a long seaboard, extending along the southern shores of the Black Sea, both shores of the Sea of Marmara, the eastern shores of the *Ægean*, and the northern shores of the eastern end of the Mediterranean. On the landward side Turkey borders on the Soviet Union (Georgia and Armenia), Persia, Iraq, and Syria. Within these confines is the Anatolian tableland with a basic height of about 3,000 feet, skirted by fertile valleys and plains, but itself largely arid and carrying numerous mountain groups and ranges, culminating on its eastern borders in Mount Ararat, rising to nearly 17,000 feet. Behind the Mediterranean coast the Taurus range towers to over 10,000 feet, broken by the famous gorge known as the Cilician Gate, giving access to the interior from the plains of Tarsus and Adana. Many large lakes are scattered over the surface of the plateau, the largest, Lake Van, near the eastern border, having an area of 1,450 square miles, which is larger than Cornwall. Rivers are fairly numerous and some are of considerable length, but in general they are not suitable for navigation; they include the upper reaches of the Euphrates. Despite the unfavourable character of the country there is a network of 4,800 miles of railways, mostly of standard gauge (4ft. 8½in.), including the Turkish sections of the through routes which function normally from London and Paris to Egypt and the Persian Gulf. Roads cover over 14,000 miles, but under 10,000 miles are in good repair.

Turkey is sparsely populated; its 20m. inhabitants, half the population of England, are spread over an area six times as large. Some 80 per cent. of the people live in rural areas, and farming is the outstanding industry, though the government aims at developing manufactures. The country is predominantly pastoral; more than half (55 per cent.) is classed as permanent meadow-land. Another 20 per cent. ranks as arable land, and 15 per cent. is covered with forests, leaving 10 per cent. for built-on areas and waste. There are great numbers of livestock: in 1948-49, 26m. sheep, 19m. goats (about a quarter of them mohair), 10m. cattle, nearly 1½m. donkeys, over 1m. horses, nearly 1m. buffaloes, and 100,000 camels.

Of the 36m. acres of arable land, about 3½m. are occupied by gardens and orchards, and 22m. are under cereal and other crops, the balance lying fallow. Wheat is easily the most extensive crop, being grown on 10m. acres, mainly on the Anatolian plateau; methods in general are primitive, and the average yield is poor, ranging from only 10 bushels to 16 bushels per acre according to the character of the season, but modern machinery is being introduced and the total yield (up to 5m. tons) is sufficient for home needs except in very bad years. Barley is grown on about 4½m. acres, maize on 1½m. acres, rye on 1m. acres, and oats on ¾m. acres.

Apart from cereals, grapes are the most extensively cultivated, vineyards covering $1\frac{1}{2}$ m. acres; but other crops, though on a smaller scale, are numerous and valuable, and contribute largely to the export trade. Especially important are cotton and tobacco. Tobacco, long the most valuable export, is grown in both European and Asiatic Turkey; it occupies about 300,000 acres, the chief centre being Samsun, on the Black Sea coast. Cotton has made rapid strides, and in 1950-51, for the first time, it displaced tobacco as the leading export; about 1m. acres have been brought under cultivation, mostly in the plains around Adana, though Izmir (Smyrna) is also a notable centre of production.

The forested areas are mostly on the slopes between the coastal region and the Anatolian plateau. They include valuable timbers, but have suffered much from the depredations both of peasants and of goats. A law to nationalise the forests and prohibit wood-cutting aroused strong opposition, and attempts have since been made to enlist the co-operation of the peasants.

Mineral resources are considerable but have not been greatly developed. A few million tons of coal are produced annually at Zonguldak, on the Black Sea coast; half a million tons of chrome ore and a quarter of a million tons of iron ore. Turkey is one of the chief sources of world supply of chrome; the ore is the chief item in her mineral exports, which otherwise are a trifling factor in the export trade, though efforts are being made to increase them. The State has taken over the Zonguldak mines and is modernising both the mines and the port in pursuance of its policy of industrial development. In the past, this policy has been combined with the nationalisation of public utilities, especially the iron and steel and textile industries, mining, and forestry; more recently, following a change of government, there has been a tendency to stress the advantages of private enterprise. Whatever developments the future may hold, Turkey's foreign trade at the turn of the half-century has predominantly the characteristics of an agricultural and pastoral country. The f.o.b. value of special exports in 1951 was £T.879m. (the Turkish pound being equivalent to just over 2s. 6d. sterling), and nearly 90 per cent. of this total was provided by animal and vegetable products—live animals, hides and skins, eggs, cereals, nuts and fruit (chiefly raisins, hazel nuts, and dried figs), leaf tobacco, raw cotton, seeds, oil-seed cake, olive oil, opium, tanning extracts, &c. On the other hand the special imports, which had a c.i.f. value of £T.1,126m., consisted largely of manufactured articles, especially machinery. Nearly half the total was provided by iron and steel in various forms; agricultural, textile, and other machinery; scientific and technical appliances; motor vehicles and parts, motor spirit and mineral oils, railway carriages, locomotives and parts. Another fifth was made up of cotton yarn and fabrics, wool and hair

yarn and fabrics, linen and hemp fabrics, artificial silk yarn, and foodstuffs, including tea, coffee, and sugar (also, exceptionally, a considerable quantity of wheat, 1951 being one of a run of bad years for cereals in Turkey).

Naturally, in a country whose economy is so largely dependent on its crops, the relative values of the chief exports are dependent on the seasons. An analysis of the returns for 1949 and 1950 shows the pitfalls in any but the broadest generalisations. Though 1949 was a bad year for cereals, it was a good year for some crops. Exports of tobacco were valued at £T.259m., or well over a third of the total; nuts and fruit at £T.114; raw cotton at £T.76m. By contrast, 1950 yielded an average crop of wheat but was a bad year for nuts and oil-seeds, while the exports of tobacco declined to such an extent (from 80,000 tons to 49,000 tons) that for the first time they had to yield pride of place to cotton; whereas the exports of cotton increased in value by more than 150 per cent., amounting to 76,000 tons valued at £T.195m., or about 30 per cent. of all the exports.

The principal ports are Istanbul, which, though no longer the capital, is by far the largest city, and Izmir (the former Smyrna), which has a fine natural harbour, preserved from silting by diverting westwards the mouth of the Gediz Chai (Hermus). The estimated populations of these and other leading cities in 1950 were:

Istanbul (Constantinople)	1,000,000	Eskisehir	.	.	.	81,000
Ankara (capital)	286,592	Gaziantep	.	.	.	63,000
Izmir (Smyrna)	230,508	Konya	.	.	.	59,000
Adana	100,000	Kayseri (Caesarea)	.	.	.	58,000
Bursa (Brusa)	86,000	Erzerum	.	.	.	53,000

SYRIA

Until the First World War, Syria was part of the Turkish Empire. Afterwards it was administered by France under mandate from the League of Nations, until in the Second World War it received promise of independence from the Free French and was constituted a republic; in 1945 it joined the Arab League, and all foreign troops were finally withdrawn in 1946.

The Syrian Republic lies immediately south of Turkey in Asia, its northern frontier being followed, for most of the way, by the course of the Baghdad Railway. On the west it has a short sea-board (about a hundred miles) along the Mediterranean, opposite to Cyprus, and it continues south on the landward side first of the Lebanese Republic, then of Israel, as far as the southern end of the Lake of Tiberias, where it turns east and north, marching first with

Jordan and then with Iraq back to the Turkish frontier. Within these limits is an area of 66,000 square miles (three-fourths the size of Great Britain), inhabited by under 3½m. people. A narrow but fertile coastal belt is backed by mountain ranges, dropping on the farther side to the valley of the Orontes, which, rising in the Lebanon, flows northwards through Syria, parallel with the coast, till it finds an outlet to the sea in Turkey, just north of the Syrian frontier. Eastward from the Orontes the country merges into the Syrian Desert, though the north-east corner is crossed by the Euphrates on its way from the Turkish highlands to the Persian Gulf.

Forty per cent. of the republic is classed as unproductive, and another 20 per cent. is unused though potentially productive. A further 15 per cent. is arable land, and the remaining 25 per cent. is mostly pastoral country, though a tenth of it is covered with forests, or the remains of forests, much damage having been done, in Syria as in Turkey, by the depredations of goats. Only two crops are grown on a large scale—wheat, which covers about 2½m. acres, but averages only 9 or 10 bushels to the acre, so that the total crop is only about half a million tons; and barley, grown on less than a million acres and yielding in a good year about a quarter of a million tons. Many other crops are cultivated, but both acreage and production are comparatively small, though the grape crop amounts to some 150,000 tons. Cotton is of increasing importance; in 1950, as the result of extended cultivation combined with a favourable season, the crop yielded 35,000 tons of ginned cotton. Northern Syria offers promising conditions, and much bigger crops are planned. The most widely renowned of Syrian products is latakia tobacco, an ingredient of innumerable smoking mixtures throughout the world; it flourishes in the coastal plains and takes its name from the port of Latakia.

Livestock are a big factor in the economy of the republic. Sheep number over 3m. and goats over 1m.; cattle about 350,000, asses and mules 300,000, horses 100,000. Among beasts of burden are some 50,000 camels, which recall the Biblical associations of the Syria of ancient times.

One of the legacies of the Second World War is a system of excellent roads. A motor-bus service crosses the desert from the capital, Damascus, to Baghdad. The through railway route from Europe to Egypt traverses western Syria, and in the north, near the Turkish frontier, links on to the Baghdad Railway. In the south it continues into Lebanon, where the port of Beirut serves as the commercial gateway for Syria. Differences between the two countries led to the dissolution in 1950 of the Customs Union and Council of Common Interests which had facilitated their intercourse since the First World War, but economic co-operation was resumed in 1952, when a new agreement was signed. The trouble

between the States of the Arab League and Israel has restricted intercourse with the latter country. On the main line to Egypt the train service is suspended between Beirut and Haifa, as well as on a narrow-gauge branch line from Haifa to Damascus; but another section of this branch line is in operation from Beirut to Damascus, whence it runs through southern Syria into the Hashemite kingdom of the Jordan.

Syria has no port of outstanding importance. Latakia (the ancient Laodicea) has only a small harbour opening into a sheltered roadstead, while much of the town (population about 25,000) is still in ruins from an earthquake in 1822. Baniyas (site of Cæsarea Philippi), south of Latakia, is the terminal of a thirty-inch oil pipeline from Iraq, which came into operation in 1952 and can carry 14m. tons a year. The chief centres of population are inland. Damascus has about a quarter of a million people, and strung along the main line of railway, from north to south, are Aleppo (about 300,000), Hama (40,000), and Homs (60,000), the junction for coastal and inland routes to Beirut.

Trade is of the character to be expected in a country in which pastoral and agricultural industry predominates. Exports are mainly animal and vegetable products; imports mainly textiles, iron and steel goods, machinery, and a large variety of other manufactures.

LEBANON

When, after the First World War, the French took over under mandate the administration of the Turkish territories comprised in Syria, they united various districts in the mountainous south-west corner of the country to form the State of Great Lebanon. When the mandate was relinquished during the Second World War, Lebanon as well as Syria was proclaimed an independent republic. It is a small country, about half the size of Wales, supporting a population of 1½m. It has a coast some 125 miles long and has a general width of about 30 miles, and consists almost entirely of a mountain range, rising in the north to 10,000 feet. The height drops farther south, but the railway from Beirut (about half-way along the coast) to Damascus (see under Syria) crosses the mountains by a pass which even there is nearly 5,000 feet above sea-level.

Lebanon, the main range, from which the country takes its name, rises in cultivated terraces from a fringe of coastal plains, and on the other side drops more abruptly, under more sterile conditions, to the Bekaa Valley, which divides Lebanon from

Anti-Lebanon—a smaller edition of the range, traversed by the Syrian-Lebanese frontier. In the Bekaa rise two rivers of classical fame: the Leontes (modern Litani), flowing southwards to empty itself into the Mediterranean after a comparatively short course, and the Orontes (Nahr el Asi, or 'rebellious river'), which flows north through Syria (*q.v.*) and has a course of over 200 miles.

The area of the Lebanese Republic is about 4,000 square miles. Nearly half is classed as built-on or waste, and nearly half as suitable for cultivation or grazing, in roughly equal proportions. The balance of 8 per cent., some 300 square miles, ranks as forest and woodland, and as in neighbouring countries, has been sadly depleted by indiscriminate felling and the ravages of goats, though there is still a cluster of the 'cedars of Lebanon' to recall one of the ancient glories of the country. It is estimated that goats number nearly half a million—vastly more than all the other four-footed domestic livestock put together. Of these latter, cattle (including buffaloes), sheep, and donkeys each number 20–25,000, and horses and mules each about half that number. Some 2,000 camels are employed, and there are only about as many pigs.

The narrow coastal plain and terraced hill slopes produce a wide variety of crops. Cereals are the most widely cultivated, covering nearly a quarter of a million acres out of little more than half a million acres of arable land. Wheat tops the list with 175,000 acres, but averages only about 10 bushels to the acre, so that the yield is barely 50,000 tons. It is followed by barley (50,000 acres; 27,000 tons), and maize (17,000 acres; 13,000 tons). Potatoes provide 40,000 tons from 12,000 acres, and pulses are grown on a smaller scale. But the outstanding crops after cereals are grapes, olives, and citrus fruits. The grape harvest amounts to as much as 90,000 tons from 50,000 acres, and 11,000 tons of olive oil are extracted from a crop of 35,000 tons. Oranges yield 40,000 tons, and lemons and other citrus fruits 25,000 tons. Bananas (14,000 tons), sugar cane (5,000 tons), ground-nuts (1,000 tons), rice (1,000 tons), and sesame seed (1,000 tons) are other cultivations testifying to the sub-tropical character of the Lebanese climate, at least in part.

Lebanon, like Syria, has a legacy of good roads from the Second World War, and a sufficient railway service from pre-war days (see under Syria), as well as an excellent port in Beirut and a secondary port in Tripoli. Imports and exports are of the traditional character of countries engaged in primary production, with little industrial development. But the commercial importance of Lebanon is not limited to its own supplies and needs. It is a flourishing *entrepôt* of trade not only with Syria, with which it is linked by an economic agreement (see under Syria), but with Jordan and Iraq; and it has on its coast the terminals of oil pipelines—two of 12-in. and 16-in. diameter at Tripoli, coming from Iraq, and one of 30-in. near

Saida (the ancient Sidon), coming over 1,000 miles across Arabia from Ras al Mishaab, on the Persian Gulf.

The chief towns and their latest known populations, in round numbers, are:

Beirut (Capital)	. . . 200,000	Zahlé	. . . 25,000
Tripoli	. . . 65,000	Saida	. . . 20,000

ISRAEL

The Republic of Israel was founded in May 1948, immediately after the British Government relinquished the mandate to administer Palestine, which it had exercised since the break-up of the Turkish Empire in the First World War. The new republic was, and is still (1953), without demarcated frontiers. The United Nations had recommended the division of Palestine into two States, Jewish and Arab, but no agreement had been reached, and the British withdrawal was the signal not only for the proclamation of Israel as a Jewish republic but for the invasion of Palestine by its neighbours. Hostilities continued till early in 1949, when Israel concluded an armistice with the bordering Arab States—Lebanon and Syria on the north, Jordan on the east, and Egypt on the south-west. The armistice laid down provisional frontiers which differed from those of the mandated area chiefly in a big ‘bite’ by Jordan out of Palestine, extending (north to south) from about midway between the Sea of Galilee and the Dead Sea to about midway along the west coast of the Dead Sea, and taking in westward most of the hill country of central Palestine—an area of some 2,350 square miles. The territory occupied by Jordan included Nablus (Shechem), Hebron, Bethlehem, and part of Jerusalem, which was divided so as to leave the modern city to Israel and the ancient city to Jordan. No peace treaties have yet ratified or modified these provisional frontiers, which present many anomalies, such as stretches of no-man’s land and the separation of villages from the farms belonging to their inhabitants, and frontier ‘incidents’ are still frequent.

The area within the provisional frontiers is estimated at about 8,000 square miles—a little larger than Wales. The country is long (from north to south) and narrow, and falls geographically into three longitudinal strips, though their continuity is broken by the broad wedge which Jordan has bitten out of Palestine. Along the coast, which Israel enjoys uninterruptedly, is a strip of considerable fertility, enjoying a good Mediterranean climate. Then comes a strip of hill country, occupied in the centre by Jordan and broken farther north by the transverse Plain of Esdraelon, running from Haifa south-east to the Jordan valley. The third strip is

formed by the Jordan valley itself, the Dead Sea, and the country beyond it to the south as far as the Gulf of Akaba—the north-east arm of the Red Sea. Much of this third strip is below sea-level—at its greatest depth nearly 1,300 feet below. The old Palestine frontier followed it continuously, but now Israel's hold on it is interrupted in the centre by Jordan's expansion westward.

Economically Israel falls somewhat differently into three parts. Coincident with the first geographical strip, the coastal plains are the principal home of the orange groves and vineyards so prominent in most Jewish settlements. At the northern end of the country, the hills and plains of Galilee are the home of mixed farming. At the southern end, the great tract of the Negev, comprising more than half the area of Israel, is a desert upland, particularly barren as it approaches the Gulf of Akaba, with limestone hills split by deep ravines, but having farther north a more regular surface with soil conditions which need 'only water to become productive. Various water-storage and irrigation schemes have been tried or projected, and Jewish settlement is on the increase, but most of the inhabitants of the Negev are still nomad Beduin. Elsewhere, the population of Israel has increased rapidly. The exodus of Arabs as refugees, estimated at 600,000 in the first year of the republic, has since been more than balanced by the unrestricted influx of Jewish immigrants, themselves often refugees from Eastern Europe. They have averaged 200,000 a year, restoring the strength of the total population to 1.4m. in 1951, and since then maintaining a continuous flow, though at a reduced rate.

With the new State still in its infancy and the population subject to abnormal conditions of growth, present statistics provide no permanent measure of development. In 1950 the land under cultivation in some form or other was returned as nearly 1,000 square miles—one-eighth of the whole country, or one-fourth of the area outside the Negev. Field crops accounted for three-fourths of the cultivated area, the most extensively grown cereals being wheat, barley, and maize. Potatoes do well, but the most important crops commercially are citrus and other fruits. Overtopping all are oranges, with an annual production at the half-century of around 200,000 tons. Many sociological experiments are being tried out in the settlements, which are organised in a variety of ways—collective, communal, co-operative, etc.

By no means all the immigrants settle on the land. Large numbers are absorbed in small industries, especially the processing of foodstuffs, the manufacture of pharmaceutical products, and the making of porcelain false teeth—all of which play their part in the export trade. One of the most important natural resources of the country are the mineral salts of the Dead Sea. A company, Palestine Potash Ltd., which was granted a concession to exploit them in

1930 had to suspend operations after the Second World War, but reopened its works in 1952 at the southern end of the Dead Sea by agreement with the Israeli Government, which has acquired a controlling interest (51 per cent.). Another major industry centres, normally, in large oil refineries at the port of Haifa, but these have been put largely out of action by the troubles between Israel and its Arab neighbours, as a result of which Iraq will not allow the crude oil to be pumped through the pipeline connecting Haifa with the Kirkuk oil-fields. Arrangements were made in 1950 to keep the plant at Haifa partly working on supplies delivered in the port by tankers. The port has a modern harbour with a depth of 30 feet alongside the main quay, and is the chief shipping centre in Israel, as well as the second largest town. Easily the largest conurbation is Tel Aviv-Jaffa: Tel Aviv, the modern Jewish seaside town of phenomenal growth, now incorporating the ancient Jaffa (Joppa). But as a port Tel Aviv-Jaffa is merely an open roadstead, with two basins—one for the lighters by which vessels anchored outside are loaded and unloaded, and the other for fishing vessels and other small craft. In line with its general policy of planned economy, Israel has its own mercantile marine, comprising in 1950 thirty vessels totalling over 80,000 tons. Apart from its Mediterranean coast, it borders the head of the Gulf of Akaba for some eight miles, at the southern tip of the Negev, and there Eilat is being opened up as a small port.

A standard gauge (4ft. 8½in.) railway traverses the Mediterranean coastal plain, and in normal times is linked up with the railways of Lebanon and Syria as part of the through route between Europe and Cairo. From Lydda—whose airport is Israel's aviation centre—branch railways connect with the coast at Tel Aviv-Jaffa and inland, through the hill country, with Jerusalem (2,600 feet). A new line is being built from Tel Aviv-Jaffa along the coast to give more direct connection with Haifa. There are also various narrow-gauge lines which bring up the total railway mileage to 260. Some of these connect with, but are no longer run in conjunction with, railway services in the neighbouring Arab States (see under Syria and Lebanon). There is an extensive network of good roads, totalling over 1,300 miles.

Trade is based at present on an aided economy, the value of the imports being several times that of the exports. The Israeli pound (I£.) enjoyed parity with the £ sterling until 1952, when it was devalued. In 1950 the exports were valued at over I£13m.

POPULATION OF CHIEF TOWNS, 1951

(Accounting for nearly half the total population)

Tel Aviv-Jaffa, 350,000

Haifa, 160,000

Jerusalem (Israel's portion; modern city only), 127,000

JORDAN

On the break-up of the Ottoman Empire after the First World War, the status of the 'Transjordan' territories—*i.e.* the territories east of the Jordan—'across the Jordan' from Palestine—was for a time indeterminate. In 1922 the League of Nations appointed the United Kingdom as the mandatory Power for Palestine and Transjordan, and recognised a British arrangement to erect Transjordan into an emirate under a son of the ex-King of the Hejaz. Development in the emirate proceeded along the lines of constitutional self-government, and when the mandate was relinquished after the Second World War the British concluded a treaty (1946; revised 1948) with Transjordan as a sovereign independent State; the Emir took the title of King, and the country was later proclaimed the Hashemite Kingdom of the Jordan. It extends eastward to the borders of Iraq and Saudi Arabia, and is also neighboured by Saudi Arabia on the south. Northward it is bounded by Syria.

Up to the time of the foregoing change of status, the western frontier followed the River Jordan down to and through the Dead Sea, and continued south along the Wadi Araba to the Gulf of Akaba—the north-east arm of the Red Sea. The fighting between Israel and her Arab neighbours in 1948 carried the Jordanian forces west of the River Jordan, and when an armistice was concluded in 1949 they remained in occupation of a tract of over 2,000 square miles of Arab Palestine (see under Israel). This tract was incorporated in the Hashemite Kingdom in 1950, and is known as West Jordan to distinguish it from the former emirate—East Jordan. In the same year the Hashemite Kingdom, which had previously used Palestinian currency, issued its own currency, having for unit the Jordan dinar, maintained at par with the £ sterling.

East Jordan is many times the size of the added territory; with an area of some 35,000 square miles, it is rather larger than Scotland. Here are the ancient lands of Gilead, Ammon, Moab, and Edom, dividing into cross-sections the narrow strip along the eastern floor of the deep rift valley (below sea-level) which carries the River Jordan and the Dead Sea, and mounting the eastern escarpment to a narrow belt of hill country with peaks of 3,000 feet to 5,000 feet, merging into a bare plateau which forms by far the largest part of Trans-

jordan. Beduin range the plateau with their flocks of sheep and goats; cultivation is confined to the hill country and the valley floor, and even there it is only in the north that settled villages are found. Elsewhere in the cultivable zone, semi-nomadic tribes settle temporarily and raise crops in season as need arises. In the hill country an average rainfall of 20 inches is spread over the months October to May, and is followed by a rainless summer. On the plateau, the annual rainfall is no more than a few inches.

All the productive land is barely one-eighth of the whole, the total classed as arable being 1.2m. acres, pastoral 1.5m. acres, and forest or woodland 85,000 acres. Further development is dependent on the possibilities of irrigation. About 100,000 tons of wheat are grown, and half that weight of barley, as well as smaller but substantial crops of sorghum and olives, and grapes in the extreme north. Other products are on a very small scale. Sheep and goats, mostly the latter, are by far the most numerous livestock—nearly half a million in 1948-49, after a big decline from the numbers in earlier years. There are about 60,000 cattle, and smaller numbers of other livestock include a few thousand camels.

No similar analysis of the agricultural economy of West Jordan is yet available. The population of both territories is estimated at 1.4m.; East and West Jordan have each normally only about 400,000, but the troubles between Israel and her Arab neighbours have resulted, according to Jordan's reckoning, in an influx of 600,000 refugees from Israel. At best, Jordan is not on a self-supporting basis, and the maintenance of so many refugees, mostly lodged in camps, has been made possible only by financial aid from United Nations funds. In addition, Jordan has had interest-free British loans of £1m. in 1949 and £1.5m. in 1952 for the development of housing, roads, and irrigation. In good years Jordan has a surplus of foodstuffs and livestock for export—chiefly wheat, also barley, sheep, wool, and fresh vegetables; in 1950, exports were valued at JD.1.6m. Imports, as usual in an aided country without a balanced economy, were very much more—JD.10.8m. Foodstuffs, building materials, and textiles are the chief imports.

The known mineral wealth is small. Some phosphate deposits are worked, and the potash salts of the Dead Sea invite attention. There has been prospecting for oil in southern Jordan. The Trans-Arabian pipeline carrying oil from the Persian Gulf to the Mediterranean at Sidon (Lebanon) traverses Jordan, and a local oil refinery has been planned. Other industrial enterprises projected include a cement works.

The Hejaz Railway, which at one time connected with Medina but does not now even reach the Hejaz, runs through the eastern borders of the Jordanian hill country as far as Ma'an, serving en route the capital, Amman. It is a narrow-gauge line (105 cm.;

3 ft. 5½ in.). There are over 400 miles of all-weather roads, and Amman is linked with the outside world by air. The capital has grown rapidly; not long ago a smallish country town, it now embraces an estimated population of 170,000. Irbid, in the settled country of the extreme north, is a town of growing commercial importance; and in the extreme south, where Jordan touches the Red Sea, important improvements are being made in the Hashemite Kingdom's sole port, Akaba.

IRAQ

The Kingdom of Iraq occupies the south-east corner of the old Ottoman Empire. It comprises the former vilayets of Mosul, Baghdad, and Basra, which Turkey surrendered, among other territories, after the First World War. The administration was entrusted, by mandate from the League of Nations, to the United Kingdom, which established a constitutional monarchy under a sovereign elected by popular vote—a son of the ex-King of the Hejaz. The mandate was relinquished in 1932, when Iraq was admitted on British recommendation to the League of Nations as an independent sovereign State. Since 1932 the monetary unit has been the Iraqi dinar (ID.), which is kept at par value with the £ sterling.

Habitable Iraq is essentially the ancient Mesopotamia—the Land between the Rivers, *i.e.* the rivers Tigris and Euphrates—with a civilisation whose roots go down to the dim and distant past. Ur of the Chaldees, Babylon, Nineveh—these are but three of many famous centres whose past magnificence has been confirmed by modern excavations. For some years after the First World War, Iraq was commonly known as Mesopotamia, but this was never the official name of the modern State and has now fallen into disuse as a synonym.

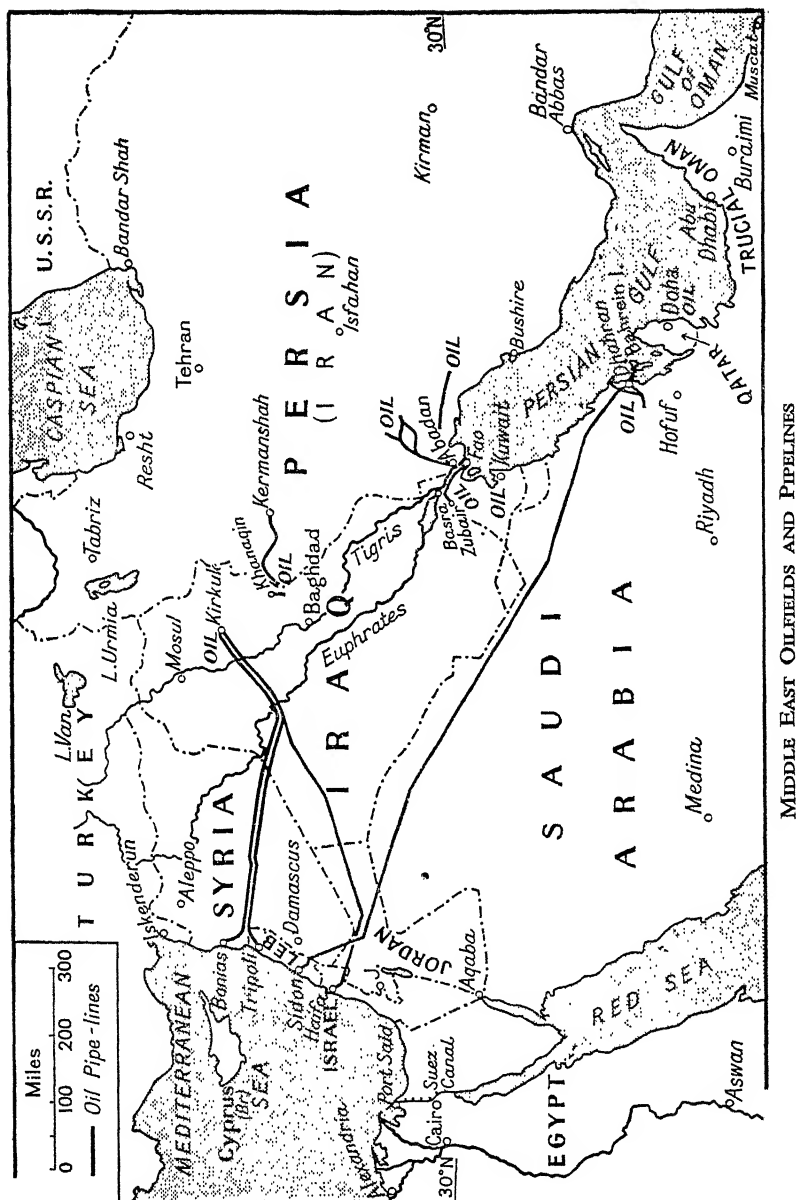
Physical features. Both the Tigris and the Euphrates rise in the highlands of Asiatic Turkey and flow for considerable distances through that country as well as, in the case of the Euphrates, through Syria before they enter Iraq and eventually unite to form the Shatt-al-Arab and discharge their waters into the head of the Persian Gulf. In Iraq the 'land between the rivers' is for the most part a low-lying alluvial plain, merging in the north into the uplands around Mosul. For untold centuries the two main rivers and their lower tributaries have meandered through this plain, often changing their courses and carrying fertility now here, now there, to a soil with great potentialities but scanty rainfall—about six inches a year, on average. Averages in Iraq are, however, apt to be particularly misleading, and droughts are often varied by floods. Apart from

irregular rainfall, the Persian frontier, which follows the edge of the alluvial plain from the Persian Gulf northwards, finally turns into Kurdistan, a large slice of which, with mountains rising to 14,000 feet, forms the north-east corner of Iraq. Several left-bank tributaries of the Tigris have their sources among the mountains, and in the rains pour down their torrents to the plain, to complicate the problem of turning it to profitable use. Irrigation and flood control—these are the twin needs of Iraq's agricultural economy. Their neglect led to the decay of great civilisations in the past. After the First World War, various works to meet both needs were carried out, and since the Second World War further schemes have been planned to extend the area of fertility.

In contrast with the conditions in the alluvial plain and in the mountainous country of the north-east, Iraq embraces on the south-west a vast expanse of desert, reaching to the borders of Syria, Jordan, and Saudi Arabia. The area of Iraq in all its parts is given as 168,000 square miles—nearly twice as large as Great Britain—and of this the western desert accounts for more than a third. The fourteen *liwas* (provinces) into which the three former vilayets are divided have an area of 102,000 square miles (twice the size of England), and support practically the total population, numbering 5m.

Products of the soil. Of the 102,000 square miles (65m. acres) covered by the *liwas*, about a third is classed as farm land or under forest. Estimates vary. The Food and Agriculture Organisation (F.A.O.) of the United Nations, on a conservative reckoning, divides about 20m. acres between arable land (6½m. acres), pastoral country (10m. acres), and woodland (3½m. acres). With improved irrigation and flood control works, the cultivable land should increase; but cultivation is on a shifting basis: even with the areas already available only parts are used in any one year, and results are as variable as the seasons and other conditions. In the ten years before the half-century, the minimum area sown to barley (under 2m. acres) produced the maximum crop (900,000 tons). Barley and wheat, grown in the winter season, are the principal cereal crops and divide most of the arable land between them. The yield per acre is low, but in good seasons the crops not only suffice for home needs but provide a substantial surplus for export, especially in the case of barley.

Rice, a summer crop, is also widely grown, areas ranging in the forties from 350,000 acres to 750,000 acres and crops from 180,000 tons to 350,000 tons. Cotton has fluctuated greatly. When the Second World War broke out, the production of seed cotton amounted to nearly 15,000 tons. During the war, when foodstuffs fetched high prices, it fell to little more than 1,000 tons. In 1950 it jumped up again, and exports were valued at over ID.1m. Pre-



viously some of the cotton grown was of an inferior type, but the cultivation of this was prohibited in 1949, and only a good type of American cotton, in demand on world markets, is now allowed. Tobacco is grown for the home market, the production of leaf tobacco ranging from about 2,500 tons to four times that quantity. It is used for the manufacture of cigarettes as a government monopoly. Five factories in Baghdad with mechanical equipment have an output of 1,300m. cigarettes a year and there are several small establishments turning out hand-made cigarettes.

The most distinctive of Iraq's crops is found in the date plantations which abound along the Shatt-al-Arab, and upstream along the Tigris and Euphrates as far as Samarra and Ana. It is claimed that 75 per cent. of the world's date palms grow in Iraq; their number is put at 30m., and the bulk of the dates entering the world's markets are exported from Basra. Experts distinguish between 350 varieties, but only five are cultivated for export. A good crop yields 300,000 tons, and exports of 200,000 tons.

The pastoral industry plays a big part in farming. There are between 7m. and 8m. sheep of the fat-tailed woolled variety, 2m. goats, 800,000 cattle, 400,000 asses, nearly 200,000 horses. Camels number nearly 300,000, and water buffaloes 130,000. Exports regularly include wool (valued at over ID.1m. in good years) and live animals.

Oil-fields. Valuable as are all these resources, and fundamental the place which they occupy in the general economy of Iraq, they are being overshadowed commercially by another product—mineral oil. Modern development began in 1925 with the grant of a concession to the Iraq Petroleum Company, representing an international group, which opened up a big oil-field around Kirkuk, among the foothills of Kurdistan, about midway between Baghdad and Mosul. Other concessions to other companies followed, for the exploitation of supplies around Mosul, Khanaqin (between Baghdad and Kirkuk), and Basra. By 1950 the annual output was 5m. to 6m. tons, mostly from Kirkuk, but other fields were coming into production, and it was recognised that the potentialities were very much greater. The companies entered into a new agreement with the government, assigning to it half the profits from the oil produced, and other benefits, and guaranteeing in 1955 onwards a minimum output of 22m. tons of crude oil a year by the Iraq and Mosul Companies, and 8m. tons a year by the Basra Company. The Basra oil-field came into operation at the end of 1951. It centres in Zubair, to the south-west of the port, and is connected by a pipeline 72 miles long with Fao, at the mouth of the Shatt-al-Arab. Eight storage tanks at Fao have a capacity of 4½m. tons, and tankers can be loaded by electric pumps at the rate of 2,000 tons an hour. Several pipelines connect Kirkuk with the Mediterranean coast. The line to Haifa is

not working, because of the feud between Israel and its Arab neighbours, but a 12-in. pipeline to Tripoli, in Lebanon, has been supplemented by a 16-in. line, and yet another and larger (30-in.) pipeline, with a capacity of 14m. tons of crude oil a year, was completed in 1952 to Banias, in Syria. The Khanaqin Company, a subsidiary of the Anglo-Iranian, operates an oil-field 30 miles south of Khanaqin, near the Persian border. Supplies are pumped to a refinery near Khanaqin, whence they are distributed through Iraq for local requirements at low prices. A large part of the increased revenue from oil has been assigned to a Development Board which will aim at extending irrigation and flood control, raising the general level of production and improving the whole standard of living in Iraq.

Trade and communications. Oil is not included in the export returns, with the result that the official totals for the imports and exports give an erroneous impression of the balance of trade. In the quinquennium which followed the Second World War, imports averaged in value about ID.40m., while Iraq's own exports were returned as worth about a third or a quarter of that amount, and in 1948—a disastrous year for grain crops—dropped to little more than ID.7½m. Normally, grains (chiefly barley) and dates provide over 80 per cent. of the official exports, other noteworthy, though variable, items being raw wool, cotton, and livestock. Iron and steel, machinery, metal goods, motor-cars, cotton and woollen piece goods, tea, and sugar constitute the major part of the imports.

The long-projected Baghdad Railway, completed in 1940, follows the right bank of the Tigris between Baghdad and Mosul, and connects through Syria and Turkey with the European railway system. It is of standard gauge (4ft. 8½in.) throughout, but a continuation southwards from Baghdad to Basra is of metre gauge, and in the reverse direction this metre-gauge line, after crossing the Tigris at Baghdad to the left bank, runs northward to Kirkuk and Erbil, with a short branch to Khanaqin. The total route mileage is about 1,000 miles, of which the Iraq section of the Baghdad Railway accounts for about a third.

There are about 4,500 miles of roads, mostly earth roads and tracks; only about 1,650 miles are metalled. Motor vehicles registered in 1951 included 11,400 cars, 1,600 motor cycles, 3,400 buses, and 6,400 lorries. Baghdad and Basra are important airports; over 6,000 aircraft arrived and left in 1949.

TOWNS WITH OVER 80,000 PEOPLE AT 1947 CENSUS

Baghdad	552,047	Nasiriyah	110,943
Mosul	340,541	Ramadi	110,684
Basra	206,302	Baquba	94,482
Amarah	183,870	Erbil	86,104
Kerbelah.	149,710	Kut	81,856
Kirkuk	148,349	Hillah	81,055

ARABIA

Arabia forms a vast peninsula of about a million square miles in the south-west corner of Asia, separated from the main mass of the continent by the Persian Gulf and the Gulf of Oman on the east, and from Africa by the Red Sea on the west. On the south it is bounded by the Gulf of Aden and the Arabian Sea. For the most part it is a desert area, and may be described as a tilted plane, raised many thousands of feet on the side of the Red Sea and gradually sloping eastwards to the shores of the Persian Gulf; though the eastern maritime plains are varied by another upward tilt along the Gulf of Oman. The desert conditions extend northwards into lands which, while within the Arab League, are not regarded as part of Arabia, and have been described in earlier chapters (see under Jordan, Iraq, Syria).

By far the larger part of Arabia is comprised in a single kingdom, Saudi Arabia—a combination of several States achieved by conquest within the lifetime of its first ruler, Abdul Aziz ibn Saud, who took the title King of Saudi Arabia in 1932. It has a long seaboard—about 1,000 miles—on the Red Sea, a much shorter frontage to the Persian Gulf, and nowhere reaches to the south coast, being fringed by Yemen in the south-west corner of the peninsula, Aden and the Aden Protectorate along the western half of the south coast, Muscat and Oman along the remainder of the south coast and the shores of the Gulf of Oman, and by various small States scattered along the Persian Gulf, including the Bahrein Islands, Qatar, and Kuwait. The essential facts about these States individually will be found below.

SAUDI ARABIA. Frontiers are ill-defined, and the area is uncertain. It has been estimated at over 900,000 square miles, but publications of the United Nations, of which Saudi Arabia is a member State, give it as just under 600,000 square miles, with a population of 6m. Its surface is apportioned among a variety of deserts, including in the south the dread Rub' al Khali, or 'Empty Quarter,' which is practically devoid of inhabitants. Elsewhere conditions are not quite so desolate, though the cultivated area, including orchards, in the whole vast country is returned as only 50,000 acres—under 80 square miles. Both agricultural and pastoral industry are practised, dates being a prominent crop, while the

livestock include camels, horses, and sheep. Two other sources of wealth are of outstanding importance, and are separately associated with the two main divisions into which the modern kingdom falls. Much of the larger division is the ancestral home of the ibn Saud dynasty, the Central Arabian State of Nejd, which, with twentieth-century annexes, stretches across the peninsula from sea to sea. The other is the Kingdom of Hejaz, occupying the north-west of Saudi Arabia; it too is a conquest of Nejd, but is governed as a separate viceroyalty. Comprising possibly one-fourth of the total area and one-third of the total population, it is the Holy Land of Islam; pilgrims by the hundred thousand flock annually to Mecca, the birthplace of the Prophet and the cradle of the Faith, and in the past these have been a major factor in the finances of Saudi Arabia.

Nejd had nothing to compare with it as a source of revenue till oil was found, in 1938, on the mainland behind the Bahrein Islands of the Persian Gulf. The exploitation of the oil-fields by 'Aramco' (Arabian-American Oil Company), on the basis of an equal division of the profits with the Saudi Arabian Government, has brought to that government relatively fabulous wealth, enabling ibn Saud to give effect to vast projects for the development of his country, including a standard-gauge railway over 350 miles long, from Dammam, the Gulf port for the oil-fields, to Riyadh, the capital, on the inland plateau. It was opened in 1951, and there are plans for its extension to Jeddah, on the Red Sea, thus completing a trans-Arabian railway. The possibilities of extended irrigation are also being newly investigated. Several areas for the settlement of nomad Wahhabis, an extreme Moslem sect closely associated with the rise of the Saud dynasty, had previously been wrested from the desert around Riyadh.

Typical of present changes, Jeddah, the port for Mecca, has been connected with that city, 45 miles inland, by a modern asphalted highway bordered by air-conditioned villas, traversed daily in the pilgrim season by thousands of the latest types of motor vehicles, and equipped at regular intervals with concrete shelters and water taps for the use of pilgrims on foot. At one point is a flourishing government agricultural centre for growing fruit and vegetables, testing new crops, and rearing seedlings for plantations of trees. Piped water supplies have been installed at both Jeddah and Mecca, and typhoid, once endemic, has almost disappeared. At Mecca, electric fans temper the heat in the colonnades of the Holy Sanctuary, a motor pump raises water from a holy well, and amplifiers transmit the Call to Prayer. The shallow port of Jeddah has been provided with a deep-water quay, and new quarantine accommodation can take 4,000 people at once. In the height of the pilgrim season, an aeroplane lands in Jeddah airport about every five minutes.

Riyadh, a five-days' journey by motor-car, is reached by air in three and a half hours.

The oil installations making possible these and other developments are being steadily expanded. In 1951 production averaged 3m. tons of oil a month, and towards the end of the year rose to 3½m. tons a month. Seven producing areas are scattered along the Saudi Arabian shore of the Persian Gulf, and a refinery at Ras Tanura has a capacity of 170,000 barrels¹ a day. Crude oil is shipped both by sea (in tankers) and by 'Tapline' (Trans-Arabian Pipeline), which runs in a north-westerly direction across Saudi Arabia, Jordan, Syria, and Lebanon to the Mediterranean coast at Sidon. This pipeline, built between 1947 and 1950, is 2 feet 6 inches in diameter, over 1,000 miles long, rises to heights of over 3,000 feet, and is equipped with six pumping stations. The continued expansion of Saudi Arabia's oil resources is the biggest factor in its prospects of future development.

Gold is also being mined on a small scale between Mecca and Medina, from ancient workings which have been opened up again by an overseas company.

Estimates of the populations of the chief towns, like most of the statistics of Saudi Arabia, vary greatly. The following list shows how wide is the range: Riyadh (the capital), 60–80,000; Mecca, 90–200,000; Jeddah, 50–60,000; Medina, 12–50,000; Hofu (provincial capital, near the oil-fields), 30–100,000.

YEMEN. This is an independent kingdom in the south-west corner of Arabia, fronting the Red Sea on the west, having Saudi Arabia on the north and east, and the Aden Protectorate on the south. It occupies the highest ground in the whole peninsula; a hot, humid coastal plain is backed by mountain ranges rising inland to over 10,000 feet before dropping to the sandy wastes of the Rub' al Khali—the vast 'Empty Quarter' of southern Arabia. The total area of the kingdom is estimated at 75,000 square miles (half as large again as England), carrying a population of 4½m. Though a member State of the United Nations and a signatory of the covenant constituting the Arab League, the Yemen is rather an isolated country, with a reputation for aloofness. Yet it is the most fertile part of the peninsula, comprising most of the territory known to the ancients as Arabia Felix. As explained in the *Commodity Section* (p. 197), the meteorological conditions in the Maritime Range are particularly favourable to coffee, which is grown extensively above 4,500 feet and has long been famous under the name of the original port of shipment, Mocha. That port has decayed, but coffee is still the Yemen's staple export; the crop is at its best around Menakha, and is shipped from Hodeida (now the premier port, with a population of about 30,000).

¹ About 700,000 tons a month. 7·4 barrels = 1 ton.

At higher altitudes in the Maritime Range, and in the highlands farther east, as well as on a central plateau, the rainfall is regular and ample for the growing of grain crops—barley, wheat, and millet—while in the lowlands grapes are grown for raisins. Hides are also exported, but the Yemen, unlike other countries in the Middle East, is better suited for agricultural than for pastoral industry. Hill-sides are carefully terraced and cultivated on intensive lines, and normally the crops are more than sufficient for local needs. The Aden Protectorate draws most of its grain supplies from the Yemen, and an Anglo-Yemeni Agreement in 1951 provided not only for a joint commission to demarcate the frontier but for British co-operation in economic development, education, and hygiene in the Yemen.

Sana, the capital, a town of 20–25,000 inhabitants, is in the eastern highlands at a height of over 7,000 feet, and most of the other chief towns lie among the mountains at altitudes of 5–8,000 feet.

ADEN. A British colony and protectorate stretching for 740 miles along the south coast of Arabia, from the Straits of Bab el Mandeb, at the southern end of the Red Sea, eastward to the borders of Muscat and Oman. Inland the protectorate extends to the confines of Yemen and to the 'Empty Quarter' (Rub' al Khali) of Saudi Arabia. The colony comprises a mainland area of 75 square miles around the port of Aden, about 100 miles east of the Straits; the rocky island of Perim (5 square miles), rising some 200 feet above the waters of the Straits; and, far to the east, off the coast of Muscat and Oman, the Kuria Muria Islands, a small group (30 square miles) ceded to Britain in 1854 as a landing place for a telegraph cable.

The port of Aden lies between two rocky peninsulas—extinct volcanoes—linked by a low-lying sandy coast. The eastern peninsula, rising to 1,800 feet, is Aden proper; the western is known as Little Aden. Offering the only good harbour on the main trade route between Egypt and India, Aden has been famed as an *entrepôt* from early times, and the opening of the Suez Canal brought it into fresh prominence as a port of call and transhipment. To-day, it is comparable with Liverpool in respect of the tonnage of the shipping entering the port; in 1950, nearly 4,300 deep-sea vessels of 18m. tons, in addition to coasters, called at Aden. It can take vessels drawing up to 34 feet, and is visited primarily as a refuelling station, both for coal and for oil. There is, however, considerable trade; it is a free port, and imports in 1949 were valued at nearly £33m., while exports (largely re-exports) amounted to nearly £15m. The bunkering of ships and handling of cargo provide the main occupation of the population of the colony—estimated at the half-century at 100,000, half of them in the chief town whose proper

name, Crater, is self-explanatory. The rainfall is negligible, in some years nil, though it has been known to amount to eight inches in a year. The only local product is salt, obtained by solar evaporation from sea-water, which is raised by windmills into shallow pans at the back of the harbour. About 750 regular and 550 casual workers are employed in the industry, which produces 200–300,000 tons of salt a year, mostly for export. The port is equipped with floating docks, and some ship-repairing as well as dhow-repairing goes on.

The protectorate has an estimated area of 112,000 square miles—almost twice the size of England and Wales—with a population of about two-thirds of a million. It is divided into Western and Eastern, the Western Protectorate being much the smaller but having rather more than half the population. Both are desolate countries, the Western Protectorate broken and rugged, rising to over 8,000 feet on the Yemen border, and the Eastern also much accidented, with peaks of 5–7,000 feet near the coast, and inland a flat-topped steppe, the Hadramaut, traversed from west to east by a great wadi of the same name. The whole country is a collection of protected treaty States, varying from a single village to large sultanates, not subject even to British indirect rule, the function of the two British Agents, Western and Eastern, being limited to advice and loose political control. Neither protectorate is self-supporting, and in the past the Hadramaut has been largely dependent on funds sent home and brought home by the large proportion of the population who emigrated to Malaysia and there accumulated fortunes. When the Second World War stopped the free movement of funds, famine ensued in the Eastern Protectorate. In both protectorates, the areas cropped by the Arabs amount to only 120,000 acres, of which sorghum millet accounts for two-thirds; and livestock number about a million, of which two-thirds are goats, the balance being made up of sheep, cattle, and camels.

A promising experiment, supported by the British Government as a Development and Welfare Scheme, is the opening up by irrigation and settlement of a tract of about 100 square miles in the Abyan district of the Western Protectorate, some 30 miles east of Aden port. Here, among other crops, a very high grade cotton of the Sudan type has done well, experimentally, and there are hopes of increasing the annual output to 10,000 bales in the near future. In 1950, imports into the protectorate as a whole amounted to £1½m. (chiefly dates, rice, sugar, simsim, spices) and exports to £200,000 (chiefly tobacco—85 per cent. of the total—honey, limes, and lemons). Aden port is the natural gateway for the Western division; in the Eastern Protectorate the chief port is Mukalla.

With all their limitations, it would be a mistake to think of the Protectorates only as a primitive desert country. The admixture they present is typified by the habitations of the people, which

range from the crude goat-hair shelters of the nomad tribes to mud-brick buildings of five to seven storeys in the cities of the Hadramaut and to the veritable palaces of the Sultans and wealthy Seiyids, remarkable not only for their size but for their grace and beauty of form.

MUSCAT and OMAN. An independent sultanate occupying the eastern corner of Arabia, with a coastline of a thousand miles lying partly along the Gulf of Oman, where it is skirted by high mountainous country, and partly along the Arabian Sea, where the land is mostly low-lying. The interior stretches back to the borders of the Rub' al Khali, and it is calculated that the sultanate has an area of 82,000 square miles (equal to that of England and Scotland), with a population of rather more than three-quarters of a million. A treaty of friendship, commerce, and navigation concluded with Great Britain in 1939 reaffirmed the close ties which had existed between the two countries for nearly 150 years. At the capital, Muscat, the postal arrangements are controlled by the General Post Office in London, and the stamps used are ordinary British stamps with the local values overprinted in rupee currency. In recognition of the Sultan's independence, Britain is represented at Muscat by a Consul.

The two chief centres, Muscat and Mattrah, lie within a mile or so of one another on the Gulf of Oman, where the mountains come down to the sea. Muscat lies at the head of a cove dominated by rocky heights crowned by old forts, and exposed to *shamels* (the violent north-west winds of the Gulf region). Commercially it has lost ground to Mattrah, which has a larger harbour, is the terminus of caravan routes to and from the interior, and now has a bigger population, though both towns are small (between 5,000 and 10,000 inhabitants). Beyond them, for over 150 miles in the direction of the Persian Gulf, a narrow coastal plain carries date gardens noted for the flavour and early maturity of their fruit. At the back, where the mountains rise to over 9,000 feet, the general aridity of the country is relieved by the green fertility of cultivated areas with sufficient rainfall for grain and other crops. Along the Arabian Sea the coast is mostly barren, but at the far western end the upland province of Dhofar is another productive area, served by the small port of Murbat. Camels are extensively bred in the interior.

A curious survival of former expansion is the territory of Gwador, on the opposite (north) side of the Gulf of Oman, forming an enclave about 40 miles long and 15 miles deep, embedded in Pakistan near the Persian border. It has a total population of about 15,000, of whom 10,000 are congregated in Gwador town and port. It is administered on behalf of the Sultan of Muscat and Oman, and trade has been on the up-grade since the Second World War.

Imports and exports for the sultanate as a whole are each valued

(1949-50) at rather more than £2m. Among the exports, dates alone account for half that sum, the only other considerable items being pomegranates, fresh and dried limes, and dried fish. The chief imports are rice, wheat, coffee, and sugar. The official monetary unit is the Indian rupee, but a more common medium of exchange is the Maria Theresa dollar, with a local value of two to two and a half rupees.

Trucial Sheikhdoms and Qatar. From Muscat and Oman to the borders of Saudi Arabia, half-way along the western shore of the Persian Gulf, stretch some 600 miles of coastal territory divided into various independent sheikhdoms having long-standing treaty engagements with Britain to preserve the peace, suppress slavery, and abstain from entering into agreements with foreign States. All told they have an area of perhaps 14,000 square miles (twice the size of Wales) with a population of 115,000, of which Qatar accounts for 8,000 square miles, and perhaps 20,000 of the inhabitants. Fishing and pearling are the basic industries, but everywhere there is prospecting for oil; in Qatar a first shipment was made in 1949, and already (1953) the output is over 3m. tons a year.

BAHREIN ISLANDS. A group about half-way along the Arabian coast of the Persian Gulf, in a large bay cutting deeply into the land. They lie about 20 miles from the mainland (the Saudi Arabian province of El Hasa), and constitute an independent sheikhdome having treaty relations with Britain dating back to 1880. Their total area is a little over 200 square miles and the total population over 100,000. They have been renowned commercially as the headquarters of the Persian Gulf pearl fisheries, and though that industry has declined they have gained new fame as a source of oil supply.

Nearly all the area is provided by the main island, Bahrein, some 27 miles long by 10 wide. It is linked to Muharraq Island (4 miles by 1 mile) by a causeway carrying a motor road and a swing bridge spanning the deep-water channel. These islands enfold two harbours, and from a third island, Sitra, another causeway and a pipeline project eastward for three miles to a deep-water anchorage. Dates, citrus fruits, and lucerne are successfully grown on the main island, and it is there also that oil has been found in the neighbourhood of the highest point, a rocky crater rising some 450 feet. First developed early in the thirties, between the two World Wars, production increased by 1951 to about 1½m. tons a year. This is small compared with the output in Saudi Arabia, on the mainland behind the islands, but Bahrein also possesses a well-equipped refinery, with a capacity of 200,000 barrels a day (10m. tons a year), which usefully supplements the mainland resources for refining oil (see under Saudi Arabia). An asphalt plant has been added to the refinery, which is situated on the main island

at Manama, the chief town of the group. The town has a population of about 30,000, and is the seat not only of the British Adviser to the Bahrain Government but of the British Political Agent for the Persian Gulf. The spelling 'Bahrain' is now used officially—as on the postage stamps.

KUWAIT. An independent sheikhdom under British protection at the head of the Persian Gulf, with an area of about 8,000 square miles (rather larger than Wales) and a population of between 150,000 and 200,000. Until a few years ago it was typical of the smaller Arabian states—largely desert, with an extensive harbour on which stood the capital, around it numerous date gardens and some cultivation of cereals and other foodstuffs for home consumption, a reputation for dhow-building, and a certain amount of general trade; but chiefly notable as a pivotal point in the political geography of the Middle East. Now its meteoric rise as one of the chief sources of oil supply in the Middle East has added to the political factor a 'big business' interest. Production for export did not start till the middle of 1946. In 1947 it was over 2m. tons; in 1950, 17m. tons. In March 1951 it was averaging 375,000 barrels a day, which (at 7·4 barrels to the ton) was at the rate of 18½m. tons a year. Then, following the nationalisation of the Persian oil industry, Kuwait's production again went up by leaps and bounds, doubling the rate in six months, till in October it was over 3m. tons a month. The immediate goal is an annual production of 40m. tons. Over 100 wells have been drilled in the 100 square miles of the Burgan oil-field at the back of Kuwait town and harbour, which together have a population of about 70,000. Ahmadi, the oil town and administrative headquarters of the Kuwait Oil Company, has some 2,600 employees, including 600 British and Americans. It lies about six miles inland at an elevation of 400 feet, and is connected by a pipeline with Mina, the oil port, where a six-berthed loading jetty is constantly employed; in a single month in 1951 as many as 180 tankers were loaded with crude oil. Most of the oil is shipped in this form, the existing refinery having a capacity of only 25,000 barrels a day (about 100,000 tons a month).

At the end of 1951 the oil company entered into a new agreement with the Sheikh of Kuwait, under which he became entitled to a half-share of the profits. Extensive development and welfare schemes are planned, including a water distillation plant with a capacity of a million gallons a day. A modern motor road connects Kuwait with Basra. The unit of currency is the Indian rupee. The postal arrangements are under the direction of the London General Post Office, and a British Political Agent is stationed at the capital.

PERSIA (IRAN)

Iran (the national name) or Persia (the alternative name by which the country is widely known elsewhere) is an independent State under a constitutional sovereign (the Shah), with an area of about 630,000 square miles (seven times that of Great Britain) and a population of some 18m. (less than half that of England). It extends from the Caspian Sea to the Persian Gulf and the Gulf of Oman, and has for its neighbours Russia on the north, Turkey and Iraq on the west, Afghanistan and Pakistan on the east. Except at the head of the Persian Gulf, where the only navigable river, the Karun, finds its way to the sea, the coastal plains bordering both the Caspian and the two southern Gulfs are very narrow, and the land rises rapidly to a plateau of 3–5,000 feet, which in turn carries mountain ranges running from north-west to south-east with peaks of 10–15,000 feet; while in the Elburz Mountains, south of the Caspian, Mount Demavend rises to 18,600 feet. This mountainous plateau is characteristic of practically the whole country, not only north and south from the Caspian to the Gulfs, but east and west from frontier to frontier. Only centrally, south-eastwards from Tehran, is it sundered by a wide trough in which lie the great salt deserts of Dasht-i-Kavir and Dasht-i-Luft.

It is estimated that rather more than half the total area is waste, and another 20 per cent. unused, though potentially productive. Forests cover nearly 12 per cent. and pastoral land 6 per cent., leaving 10 per cent. classed as arable. Nearly three-fourths of this last is returned as temporarily fallow, so that less than 3 per cent. of the total is under cultivation, including orchards and gardens. But in a country of the size of Persia, even small percentages of the whole are extensive. Woods and forests cover 73,000 square miles—half as large again as England. The pastoral country is three-fourths the size of England, and the arable land larger than England and Wales. Even the area actually cultivated comprises 18,000 square miles, or nearly 12m. acres—three times the size of all Yorkshire. Wheat is easily the leading crop; it is grown throughout the country, covers nearly 5m. acres, and with a yield of 15 bushels an acre, in good years, provides a crop of 2m. tons. Barley is also extensively grown, covering about 1½m. acres and yielding between

three-quarters of a million and 1m. tons. Other leading crops are more of a sub-tropical character.

The southern littoral, bordering the Gulfs, suffers from a very scanty rainfall, but it has a big asset in the date palm and is largely responsible for Persia's annual production of some 120,000 tons of dates. On the other hand the coastal plain along the southern shore of the Caspian, though narrow, enjoys an abundant rainfall and a fertile soil which together make it the most productive agricultural region in Persia. Where the forests which are the natural covering of this region have been cleared, it yields large crops of rice, fruit, cotton, and other products. Mulberry trees flourish, and the provinces bordering the Caspian are the centre of the silk industry. Rice is the most extensive crop after wheat and barley; in all, nearly half a million tons are grown on over half a million acres. Cotton is grown on about a quarter of a million acres, yielding some 30,000 tons of cotton seed and 20,000 tons of ginned cotton. No figures are available of the acreage under vines, but before the war the crop of grapes averaged half a million tons, and though production has since declined, post-war returns indicate a yield of a quarter of a million tons. Oranges are a much smaller crop, but have increased since the war to 40,000 tons. Sugar-beets—a heavy crop—produce 200,000 tons of beets from some 70,000 acres, and yield nearly 50,000 tons of raw sugar. About half that area is under tobacco, yielding a crop of nearly 40m. lb.

Livestock are a big factor in Persia's land economy. Sheep number 13m. and goats 7m. There are 2½m. cattle and half as many asses. Animal products include 40,000 tons of butter, 15,000 tons of cheese, and 13–14,000 tons of wool (greasy). It is indicative of the conditions in much of the country that the returns record only 300–400,000 horses, but as many as 600,000 camels.

In one way or another, 80 per cent. or more of the population are engaged in the agricultural and pastoral industries. The standard of living is low, and likely to remain so till more efficient methods of production are practised. The character of much of the country is a limiting factor, and expansion of the cultivated area is largely dependent on the spread of irrigation. Except along the Caspian and in a few other favoured areas, irrigation is already the governing factor in agriculture.

Manufactures are numerous, but mostly on a small scale. In some—*e.g.* tobacco and sugar—government exercises a monopoly, and in some it participates; there are government cotton ginneries and government textile mills. Of outstanding importance is the manufacture of carpets. Persian carpets are world famous, and provide from a quarter to a third of the exports in value, other than oil. Oil is a factor of the first importance in Persian economy, and until 1951 was the chief commercial product. The Anglo-Iranian

Oil Company, in which the British Government had a controlling interest, held a concession to work the main oil-fields, near the head of the Persian Gulf. In the course of many years the company raised the output to 30m. tons of crude oil in 1950. It had also built up one of the largest oil refineries in the world at Abadan, on the Shatt-al-Arab, with an annual capacity of 20m. tons. In 1951, while negotiations for giving the Persian Government a larger share of the profits were in progress, the *Majlis* (National Assembly), contrary to the terms of the concession, passed a Bill nationalising the oil industry and claimed control of the operations. The International Court of Justice at The Hague gave a provisional ruling against this unilateral action, but the Persian Government refused to recognise the Court's jurisdiction and after prolonged attempts to reach an agreed solution both the oil-fields and the refinery were abandoned by the company. Persia severed relations with Britain, but resumed them and renewed negotiations in December 1953.

Before this trouble, oil was far and away the most valuable item in Persia's trade. In 1948-49, petroleum and petroleum products provided 90 per cent. of total exports valued at 19,000m. rials, equivalent in terms of the devalued pound sterling to over £200m. at the official rate of 90 rials to the £ (at the free market rate the sterling value was about one-fourth less). Total imports were valued at nearly 5,500m. rials (£60m.), of which between one-fourth and one-fifth were imports on behalf of the Anglo-Iranian Oil Company. Apart from the oil trade, the chief imports were textiles and food-stuffs, including beverages, and the chief exports were carpets and rugs, fruit, and plant products.

Transport in Persia is not easy, and the Trans-Persian Railway, opened in 1938, represents a considerable engineering feat. The line is of standard gauge and runs for 872 miles from Bandar Shah, at the south-east corner of the Caspian, through Tehran to Bandar Shahpur, at the head of the Persian Gulf. From Ahwaz a branch line (76 miles) connects with Khorramshahr, where the Karun joins the Shatt-al-Arab, and branch lines have long been under construction from Tehran to Meshed in the east and to Tabriz in the north-west. An older line (96 miles) runs from Tabriz northwards to Julfa, on the Russian frontier. Other lines are building or planned, but most of the big towns in Persia are still without railway communication. There is an extensive road system, but few of the roads are metalled.

Estimated populations of towns of over 100,000 inhabitants:

Greater Tehran (capital)	1,000,000	Meshed	191,000
Tabriz	272,000	Hamadan	122,000
Abadan and Khorramshahr	201,000	Shiraz	114,000
Isfahan	192,000	Resht	110,000
		Kermanshah	106,000

AFGHANISTAN

Afghanistan is an inland State, bordered on the north by the southernmost republics of the Soviet Union, on the west by Persia, on the south and east by Pakistan, and in the extreme north-east corner it touches China and Kashmir. It is a constitutional monarchy, member of the United Nations, with an area of some 230,000 square miles, and a population of 12m.—almost double the size of Norway, with nearly four times as many people. The country is extremely mountainous, an extension of the Persian plateau and, like Persia, carrying on its basic elevation wild and lofty mountain ranges. Afghanistan may be likened to a gigantic oval pan, its main axis running from north-east to south-west, with a pan-handle projecting to the north-east—the narrow Wakhan valley, 180 miles long, bordered by the giant peaks of the Hindu Kush, soaring to 20–25,000 feet. The range extends into the heart of Afghanistan on a diminishing scale, with peaks of 15–20,000 feet north of Kabul, the capital, itself at an elevation of nearly 6,000 feet; and successive ranges continue under various names to the Persian border. Other ranges rising to several thousand feet branch off from the main range and cover most of the country, which drops to comparatively low elevations only in the Seistan Desert in the south-west, and in the river valleys, notably the Oxus (Amu Darya), whose upper waters, falling to 1,200 feet, form part of the northern frontier. In the north-west the upper waters of the Hari-Rud drain the country round Herat, on their way to lose themselves in the Kara Kum desert of the Soviet Union. The south-west is drained by the Helmand, destined to the same fate in marshes on the Persian border. The Kabul river, flowing east, passes into Pakistan and joins the Indus. None of these rivers is navigable in Afghanistan, but with their affluents they drain most of the country and furnish potential sources of hydro-electric power, already developed to some extent in the service of the capital, which has power stations of 3m. and 9m. kwh. Rainfall is scanty, and practically negligible in summer, but the melting mountain snows permit of irrigation. Great extremes of climate are experienced. On the plateau at 7,000 feet the winter temperature may drop to zero Fahrenheit, and in the Oxus valley summer temperatures of 120° F. have been recorded.

The geographical similarity of Afghanistan to Persia is reflected in the economic character of the two countries. Though so much of Afghanistan is useless for farming, cereals and other crops are grown in sheltered valleys, and there are wide stretches of pastoral country supporting large numbers of livestock. Two food crops are often produced in the year—one of wheat, barley, or lentils, the other of rice, millet, or maize. Great quantities of fruit are also grown (grapes, apricots, figs, etc.), and cotton and tobacco do well in places. Before the Second World War the total area of arable land, including orchards, was unofficially estimated at nearly 3m. acres—less than 2 per cent. of the whole country; and the area of forest land at 2½m. acres. Details are only now becoming available; some appeared in the *Yearbook of the United Nations Food and Agriculture Organisation* (F.A.O.) for the first time in 1950. The wheat crop was given as 1.7m. tons (over 60m. bushels), the rice crop at a third of a million tons, and the production of grapes at 20,000 tons. Cotton is grown in the north, in the Oxus valley, and a pre-war unofficial estimate put the area at nearly 200,000 acres, producing 20,000 tons of cotton seed and 10,000 tons of ginned cotton. It declined greatly during the war, but has again been attracting attention, though in 1949 the production was still less than half the pre-war estimate. A cotton mill had 500 looms and employed 2,000 men.

Sheep are estimated to number 14m., goats 6m., and cattle 2½m. There are half a million horses, a million asses, 200,000 mules, and 350,000 camels. Animal transport by caravan is still the commonest in the absence of railways, though motor transport is on the increase as roads improve. There are two distinct classes of sheep—the fat-tailed, bred for mutton and yielding also a good though coarse wool; and karakul, whose lambs, killed at birth, have the close, curly black wool known as astrakhan. Among the animal products are 7,000 tons of greasy wool annually, and in 1945-46, the first year of post-war trade, nearly 2½m. karakul skins were exported to the New York and London markets. They accounted for nearly half the \$55m. at which the total exports were valued, and dried fruits came next, the two together making nearly 80 per cent. of the total. Lower in the scale of export values are cotton, wool, and carpets. Prominent among the imports are electrical and other machinery, textiles, petrol, and, from India, tea, coffee, and sugar—this last to supplement small local supplies extracted from sugar-beet grown in the north.

Afghanistan has many mineral deposits, but so far few have been seriously investigated or exploited. There are large deposits of coal in the Hindu Kush, and promising indications of oil in the north.

Kabul, the capital, in east-central Afghanistan, is not only the

seat of government but seat of a university founded in 1932 and officially inaugurated in 1946, with faculties in the arts, law, medicine, and science. It is also the chief commercial centre, the Gateway to Afghanistan from Pakistan and India *via* the famous Khyber Pass, connected with Peshawar by a motorable road 200 miles long. With an estimated population of 200,000 it is easily the largest city in Afghanistan. Two others have populations of over 50,000—Kandahar (77,000) in the south, across the frontier from Quetta; and Herat (75,000) in the north-west, towards the Persian border.

THE MONSOON COUNTRIES AND THEIR DEPENDENCIES

INDIA AND PAKISTAN

There is no part of the world better marked off by nature as a region by itself than the Indian sub-continent, now comprising the Republic of India and Pakistan, both independent countries within the British Commonwealth of Nations. The boundaries between India and Pakistan are shown in the map on p. 563. It will be convenient first to deal with the sub-continent as a whole. It is a region, indeed, full of contrast, in physical features and in climate, and one that has never been, strictly speaking, under one rule; but the features that divide it as a whole from surrounding regions are too clear to be overlooked. On the north it is bounded by the Himalayas, the loftiest mountains in the world; on the west, as we have already seen, it is bounded by mountains and deserts; and on the east and north-east it is not only bounded by mountains, but lofty mountain chains and deep valleys follow one another for hundreds of miles. Elsewhere the boundary is the sea.

Within the mountains a vast plain, from about 150 to more than 300 miles in width, sweeps round from the delta of the Ganges and Brahmaputra in the east to that of the Indus in the west. The peninsular portion to the south of these plains is mainly made up of tablelands varying in elevation for the most part from about 1,500 to 2,500 feet. On the west this tableland advances close up to the sea, and is bounded by the mountains called the Western Ghâts—in reality the lofty edge of the plateau; but on the east its edge is generally at a greater distance from the coast and is more winding. The name of Eastern Ghâts is sometimes used generally for the whole of this eastern margin, sometimes restricted to its southern portion.

The dense population is for the most part confined to the plains, but is prevented by climatic and other circumstances from extending over their whole area.

Structurally the plateau of Peninsular India is built up of a great mass of ancient metamorphic rocks. More than 200,000 square miles

of these in the north-west are covered by great sheets, almost horizontal, of basaltic lava (the so-called 'Deccan Traps') which furnish a dark, almost black, soil well suited to cotton. Old basins in the surface of the plateau are filled with sedimentary rocks, including the main coal-bearing strata. The great plain of the north and the coastal plains of east and west are built up of alluvium and other recent deposits, furnishing deep rich agricultural soils. The mountain wall of the north is of Tertiary or Alpine age.

The **mineral wealth** of India is tolerably abundant. Geological surveys show that both coal and iron ore are widely distributed, but of the coal-fields the most productive lies in the west of Bengal and the east of Bihar. The most productive parts of the chief coal-field lie in the Damodar valley belonging to the basin of the Hooghly, where about nine-tenths of the coal raised in India is produced. Rāniganj, about 120 miles north-west of Calcutta, was long the principal coal-mining centre, but the production of this field has at last been eclipsed by that of the Jherria field, about 40 or 50 miles further west. Still further west is Daltonganj. On the tableland three important coal-fields are now connected with the Indian railway system. One is that at Umarā, east of Jubbulpore; another, that of Warorā, in the Wardhā valley of Madhya Pradesh (Central Provinces); and the third that of Singareni, in Hyderabad.

The total production of India averages about 30m. tons; the production of Madhya Pradesh and Hyderabad representing only about 1m. tons in each case. These coals all belong to the Permo-Carboniferous or Gondwana deposits and are good quality bituminous coals. Lignites and brown coals, of little importance, occur in Assam and the Punjab.

It will be noted that all the coal resources of the sub-continent, with the exception of some Punjab lignites, lie in the Republic of India and not in Pakistan.

Iron ore is widely scattered over the mountainous and hilly parts of the country, and with the profuse employment of charcoal for smelting, Indian villagers made iron of excellent quality. But this expensive mode of working has been almost superseded by the import of European iron and iron wares, followed by the development of the European production methods in India. Of the earlier attempts to introduce the modern processes of smelting in India the most successful was that of the Bengal Iron and Steel Co. near Barākar in the north of the Rāniganj coal-field, where ores are obtainable, and a suitable coal for smelting is procured at Karharbāri or Giridhi. For many years little progress was made, but in the early years of the present century the company began to supplement the local clay ironstone ores with magnetites obtained in Chota Nagpur. Later, in 1911, however, a more ambitious programme was initiated by the Tata Iron and Steel Co., which obtained leases

over the rich massive ore bodies of the northern part of the Mayurbhanj state of Orissa, and the Raipur district of the Central Provinces. Later even more important deposits of iron ore were discovered in the district of Singhbhum, to the south-west, and the company obtained a concession in which, it is said, a ravine cutting across the ore range shows a continuous thickness of 700 feet of hematite, containing more than 60 per cent. of iron. Even before this last discovery, blast-furnaces were started in 1911. Steel was first produced from modern rolling mills in 1933. The site chosen for the new industry was Jamshedpur where some formerly exploited ores were available. Here the Calcutta-Bombay railway (*via* Nagpur) has a branch to Asansol and the coal-fields (about a hundred miles away), whilst the main ore-fields lie 45 miles to the south-west. Limestone and manganese are within easy reach. Thus a village in the barren scrub quickly grew into a town of over 100,000 inhabitants. Jamshedpur is now a great industrial centre, producing not only a great variety of articles in iron and steel, including mill and electrical machinery, but also heavy chemicals, fertilisers, and explosives. The large demand for tin-plate by the Burmah and Anglo-Iranian Oil Companies led to the erection of plant in Bengal capable of manufacturing about 30,000 tons of tin-plate annually. The Tata Company's output exceeds 1½m. tons of pig iron a year and approaches a million tons of steel and supplies three-quarters of India's requirements. The Tata Company had a monopoly of steel until 1934-35 when works were erected at Belur, north of Calcutta.

Until the separation of Burma's production from that of India **mineral oil** ranked second in value amongst the mineral products, but over 80 per cent. of the output came from Burma. The Indian production is from the Khar and other small fields in the West Punjab (Pakistan), with refineries at Rawalpindi and from several small fields in Assam, notably at Digboi. India is the second or third largest producer of **manganese ore** in the world (p. 289). The ores are widely distributed in the old rocks of the plateau, many are very rich, and many areas have been worked. The deposits in Central Provinces were opened up only in 1901 but soon yielded three-quarters of the total production. Later Sandur in Madras became the biggest producer.

Silver, though formerly the standard metal of the country, is not abundant and the output formerly credited to India was almost entirely from the Bawdwin Mines of Burma; the same is true of lead. **Gold** is important now only in the Kolar field of Mysore, the production ranging between 150 and 400 thousand ounces of fine gold. Copper is found in the Singhbhum district of Bihar though mining and production have been irregular, and the small deposits of the Himalayas are not now exploited. **Chromite** is

found in many parts of India and is worked especially in Singhbhūm, Mysore, and Baluchistan. **Mica**, valuable as an insulator, is a characteristic Indian mineral and is obtained from the old rocks in many parts of the plateau, the huge sheets from the Nellore district of Madras being specially famous. **Monazite** and **tungsten** ores take an important place in Indian minerals. Despite the existence of some famous Indian diamonds, production is unimportant.

Salt in India, as in all vegetarian countries, is a necessity of life more urgently required than in countries in which more animal food is consumed. It is obtained by evaporation all along the coasts (especially at Bombay and Madras) and is quarried in the form of rock salt in the Salt Hills of the Punjab. The much disputed salt tax or duty has long been an important source of revenue. The extraction of saltpetre (nitrate of potash) in the Punjab, United Provinces, and Bihar has declined from various causes, but chiefly in consequence of the competition of Chilean nitrate and latterly of artificial fertilisers. In India it is a natural product formed in alluvial soils from animal and vegetable refuse in a climate with alternating wet and dry seasons. In the dry season the efflorescence was collected from the soil and purified.

As regards **climate**, the Indian year is popularly divided into three seasons—the hot, the rainy, and the cool; but these names are appropriate only in the north-east and to some extent along the western coast. In the south, where the latitudes are low, there is no really cool season, and in the north-west, though the rains occur at the same period as in the Ganges valley, they are small in amount. The hot season is from March to May inclusive, the period that embraces the change of the monsoons from north-east to south-west, but before the ‘bursting’ of the south-west monsoon—that is, before the southerly winds begin to be accompanied by rain. During this period the highest temperature is in the heart of the Deccan. The rainy season lasts from June to October inclusive, and during this period the western slopes of the Western Ghāts, the hills of Assam, the slopes of the eastern Himalayas, and even the plains of the Ganges delta, are deluged with rain, and the greater part of the north-east receives a fairly abundant rainfall. The part of the Deccan immediately behind the Western Ghāts, however, has a very moderate and precarious rainfall, and so too have the plains in the north-west. A large part of the Indus valley is almost rainless. Where the rains are abundant the temperature is mitigated, but in the arid region just referred to this is naturally the hottest period of the year. The cool season, or the season of the north-east monsoons, lasts from November to February inclusive. The earlier part of this period is classed more scientifically as the period of the retreating monsoon—giving thus a fourth season. The storms of October, November, and December bring rain to the south-eastern

plains, the moisture brought by the winds from the Bay of Bengal being condensed in consequence of the obstruction presented by the Eastern Ghāts and the mountains of Travancore. But the amount of rain that falls on those plains is only one-third or one-fourth of that which falls on the best-watered plains in the north during the rainy season. The cool or winter season is naturally coolest in the north-west, where the highest latitudes are reached, and even on the plains there are genuine winter temperatures by comparison with the extreme heat of summer. In this region, in the latter half of the cool season (January to about March) there is a recurrence of rains, believed to be brought about by cyclonic disturbances originating in the Mediterranean.

The amount of rain that falls varies in India, as everywhere else, from year to year; but it is an important fact that, whereas in a country like England the variations in the rainfall may increase or diminish the abundance of a crop, in a large part of India the variation may be such that in one year there is an ample supply for a good crop, in another a rainfall wholly inadequate to produce any crop at all. It is this area of uncertain rainfall that is liable to be visited by famines and hence **irrigation** has to be practised not only in those parts of the country in which there is always a deficiency of rain, but also in those in which it is doubtful whether the rain may be sufficient or not. Even where the amount of the rain is sufficient for the requirements of the crops irrigation is in many cases demanded by the mode in which the rain falls. The north-east monsoon, on which the southern plains (Madras) chiefly depend for rain, is remarkable for the fact that rain falls for the most part in bursts, and generally at night. 'I have known,' says Sir Arthur Cotton, 'a fall of ten inches in one night, and twelve in another fortnight after'—half a year's supply in two showers. Accordingly Madras and the Deccan generally are dotted with thousands of tanks or reservoirs for irrigation-water, except in those portions, chiefly lying in the north-west of the Deccan, which are covered with the black soil described on p. 555.

These tanks usually contain little, if any, more than one year's supply, and hence are altogether inadequate to meet the uncertainties arising from recurring years of drought. In certain places, however, there is a natural storage of water underground that can always be made available by means of moderately deep wells. This is true of most areas of alluvium but not where ancient rocks underlie the surface. The whole of the plain along the base of the Himalayas has constant supplies of fresh water at a greater or less depth, and the middle portion of it has these supplies near enough to the surface to be easily reached. Hence, between Delhi and Benares, the upper levels of the alluvial plain are riddled like a sieve with water-holes or wells ten to fifty feet in depth.

The greatest irrigation works are canals led from rivers. In the Indus valley the old canals for irrigation in Sind were merely laid so as to carry off the surplus water, when the melting of Himalayan snows caused a rise of the water in the main stream and its tributaries. These were known as inundation canals and were for long in operation, and, though very useful and profitable in most years, the supply of water by this method is precarious, as the rise of the rivers may be so small as to yield little water or none at all. But works of much greater magnitude have been made in the form of canals, into which is led nearly the whole body of water belonging to a river for a greater or less distance. These are known as perennial canals. On the delta of the Cauvery such canals are said to have been constructed as far back as the fourth century of the Christian era, but under British rule such works were extended to all the other deltas of the east coast and many parts of the plains of northern India. About 1885 the total length of canals under government supervision was above 28,000 miles, and the area irrigated by them was equal to that of Belgium (11,400 square miles). In 1919-20 the area irrigated had been increased to about 28,000 square miles—almost the area of Scotland. In April 1914 the Upper Swat Canal, which involved the piercing of a canal through the Malakand Hills to establish a colony of nearly 600 square miles in extent in the northern part of the Peshāwar district, was opened. In 1922 legislative sanction was given to a project (completed in 1933) for the construction of a dam (Lloyd Barrage) across the Indus at Sukkur, which made it possible to place some 5½m. acres under perennial irrigation, of special importance for cotton cultivation. It is estimated that the execution of this scheme rendered about 400,000 acres (625 square miles) available for the production of long-staple cotton similar to that of Egypt. With the view of extending irrigation into the arid and frequently useless desert tracts in Bahawalpur and districts in the south-west of the Punjab, the Sutlej Valley Canals were commenced and, like the Sarda works of Uttar Pradesh (United Provinces), were finished shortly before the Second World War. There are other works actually in progress often coupled with the development of hydro-electric power which can then be used to pump water from tube wells tapping underground supplies not reached by shallow hand-dug wells. It has been said, with some truth, that India adds a new Egypt to her area every year. In 1931-32 the total area of British India irrigated was over 77,760 square miles; in 1947, when the countries became independent, there were 57,400 square miles irrigated in India and 31,700 in Pakistan, totalling 57m. acres. There are no irrigation canals on the lower Ganges, where they are not required; none on the area between the Ganges and the Gogra, for the reason stated in the previous paragraph; and few on the upper parts of the rivers of the

Deccan, where the depth of the river valleys below the surrounding country does not generally admit of this mode of irrigation. These canals serve little for navigation; indeed one of the few canals in India used primarily for this purpose is the Buckingham Canal, which, being a salt-water canal, is not available for irrigation, but forms an inland waterway from the mouth of the Godavari to Madras, and some distance farther south.

In connection with irrigation it may be pointed out that the structure of the country, combined with the character of the climate, affords in many places, as in the Himalayas and the Western Ghāts, the opportunity of forming immense tanks or reservoirs by damming the mouths of narrow valleys, providing at once the means for irrigation and the development of water-power. In one case the headwaters of the Periyar in Travancore have been dammed and the lake thus formed drained through a tunnel to the east side of the Cardamom Hills, so as to irrigate arid plains in Madras.¹

Despite the recent developments in industry, India and Pakistan remain primarily agricultural. At the census of 1881 the number of persons directly supported by **agriculture** and the rearing of livestock made up 72 per cent. of the male inhabitants engaged in some specified occupation. There has since been little change, for the percentage in 1911 was 71, 1921 over 73, and 1931, 68. The holdings are mostly small, on an average about five acres each. In Bengal, the Famine Commissioners in 1880 reported that two-thirds of the peasant holdings were only about half that size. Taking present day India and Pakistan as a whole, the cropped land represents less than 0.8 acres per head of population, compared with more than three times this area in the United States. This small acreage combined with very low yields means that much of the Indian population is near the starvation level and below it in years of bad harvest.

For the most part two crops are reaped in the year, but not usually from the same land. In the area of the summer monsoon rains, one crop is generally sown in the early weeks of the monsoon (June and July), and reaped in October and November; the other is sown at the end of the monsoon and reaped from January to March. The latter, accordingly, is the winter crop; and as the winter throughout the north-western half of India is at least as cold as the summer of northern Europe, wheat, barley, and linseed are among the winter crops of the region wherever the duration of cool weather is long enough to ripen them. Although the cultivation of wheat has extended southwards to the southern limits of Bombay

¹ One of the schemes of the kind formed primarily with a view to power development was that for the damming of the headwaters of the Konya river to the south of Bombay, so as to render electrical energy available to the amount of 300,000 horse-power.

and Hyderabad, the chief region of production of this cereal is in the provinces of the Punjab in Pakistan and India, and Uttar Pradesh, that is, far in the north.

Although wheat, largely in consequence of the extension of irrigation in the north-west, has been in years of plenty an export crop, it has become one of the staple food crops for home consumption in the north-west. Crops that may be described as universal in India are millets, pulses, and oil-seeds; and except on the best watered plains, suitable for rice-growing, and in parts of northern India where a stronger grain is required, millets and pulses, along with garden produce, form the bulk of the food of the agricultural population. The most extensively grown unirrigated crop in India is the great millet, here known as *jowar*; the millet next in importance is the smaller spiked millet, or *bajra*; and the principal pulse is, as in Spain, the chick-pea or *gram*. Grains and pulses occupy nearly four-fifths of the cropped land. A third of this is occupied by rice, a quarter by millets, with wheat, maize, and barley following. The oil-seeds most extensively grown are sesame, ground-nuts, linseed, castor-oil, mustard, and different kinds of rape. Pea-nuts or ground-nuts with their nitrogen-fixing root-bacteria have enabled poor tracts of sandy soil previously useless to be brought under cultivation.

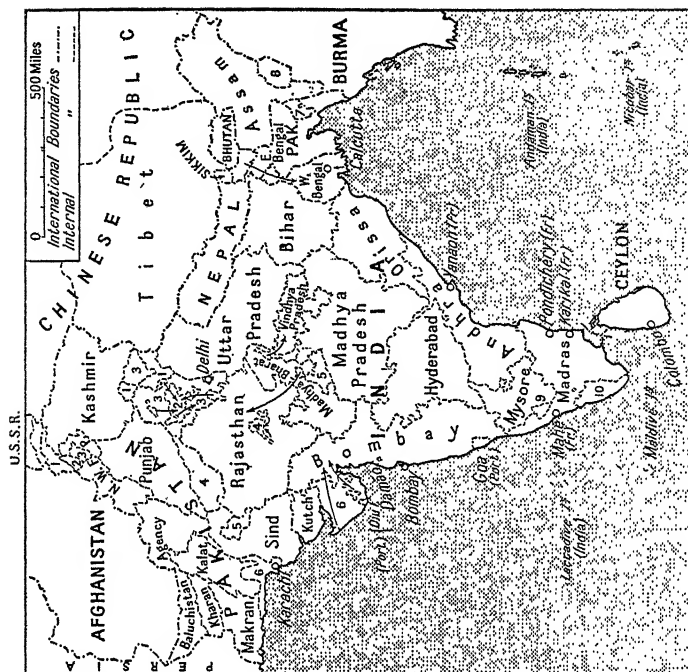
Opium cultivation has now almost disappeared but had its chief seats in the valley of the Ganges round Patna and Benares, and in central India in the region corresponding to the old kingdom of Malwa. Cotton is grown on the southern tableland, and above all in that series of fertile plains opened up by the railway that ascends the Tāpti valley—that is, the plains of Khandesh in Bombay, and of northern Berār, both lying on both sides of the Tāpti, and those of the Wardhā in the west of Madhya Pradesh. It is likewise largely grown on many other parts of the tableland, but the finest cotton of India—long-stapled American varieties—is grown on irrigated land in the Punjab. Regarding rice, jute, tea, lac, coffee, and indigo, nothing need be added to what will be found under these heads elsewhere in the book; and among the vegetable and animal products not mentioned in the table, reference may also be made to cinchona, silk, and pepper, all of which are likewise treated separately. Formerly India was largely dependent on other countries, notably Java, for supplies of sugar. Sugar-cane is now, however, largely cultivated in the northern plains, and sugar is also derived from palms, chiefly in southern India, and the home production is equal to at least that of the total consumption. With respect to the export of hides and skins, it should be explained that cattle are the chief beasts of draught and burden in the greater part of India, but that in the wet plains of eastern Bengal and elsewhere they give place to buffaloes. Cattle include the large white humped zebu or brahmin cattle and the smaller, also humped, brown animals. The

yield of milk from both cattle and buffaloes is very small, and dairy farming is as yet little developed except in a few parts of Bombay and Uttar Pradesh.

Industries. Not only in metal-working, but also in various other branches of manufacture, the old Indian handicrafts suffered greatly from European competition. Cheap Manchester cottons and, more recently, the products of the native cotton factories of Bombay and the influx of Japanese goods, have told heavily on the old hand-spinning and weaving. Even the fine muslins of Dacca (Bengal) and Madras, for which India has long been celebrated, have almost become a thing of the past. Factories and industries are spreading, not only in cotton and jute but in other manufactures, and tremendous development took place during the Second World War at places like Kanpur (Cawnpore). The exploitation of cheap labour has been carefully controlled, especially since the Indian Factory Act, which was entirely revised in 1922 and 1923.

In the making of various articles of luxury and art, however, Indian artisans still excel. Silk factories worked by steam exist in Bombay, but the making of richly figured silks by hand is still carried on to a large extent in Murshidābād (Bengal), Banaras (Benares), Ahmādābad, Trichinopoly, and other old towns of note. Cashmere shawls are still made both in Kashmir and the Punjab (Amritsar, Ludhiana, and elsewhere). Indian carpets and rugs are articles of export, and so also are a variety of articles skilfully wrought in ivory, gold and silver, copper and brass, but the quality of many of these articles has been greatly injured through the want of taste in European purchasers. The cotton and silk factories and the jute factories of Bengal are an illustration of the growth of the modern spirit of commerce in India, which is shown also in the rapid increase in the number of Indian joint-stock companies. The cotton mills are mainly in Indian hands, but the jute factories until partition were mostly the property of British capitalists. It may here be added that in the Bombay factories work can be carried on all the year round without artificial light, the short hours of daylight in winter not being present as in higher latitudes. From 1930 onwards there was a rapid growth of sugar factories.

Communications. In the plains communication is naturally easy. The scarcity of stone in the great plains has been an obstacle to the making of good metalled roads and often the only local material available is the small concretionary nodules or 'Kankar' of the older alluvium. With the development of concrete and other all-weather motor-roads, especially during the Second World War, there has been an enormous increase in lorry traffic, but the slow-moving bullock shuffling along at under two miles an hour is still almost universal. The rivers of the Ganges basin furnish good waterways, or did until the coming of the railways and the utilisa-



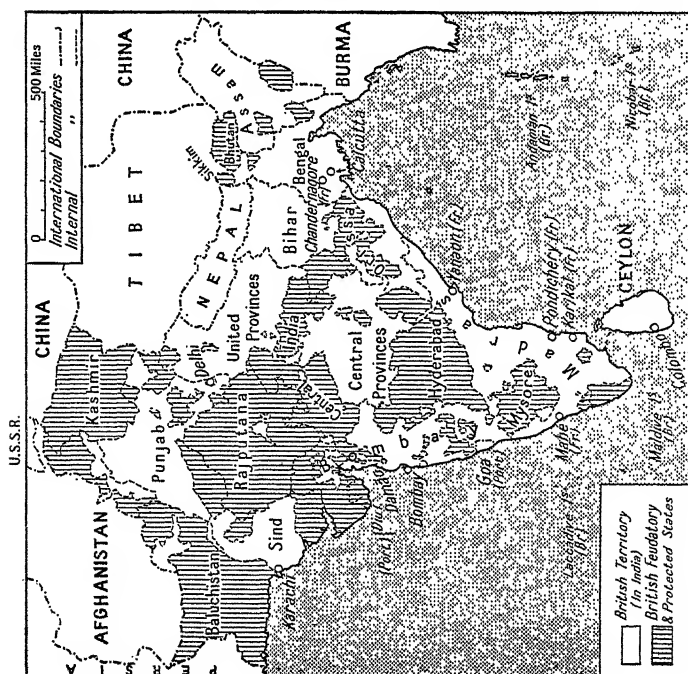
INDIA AND PAKISTAN, 1953

Key to numbered states in right-hand map:

India—(1) Himachal Pradesh, (2) Patiala and East Punjab States Union (PEPSU), (3) East Punjab, (4) Aimer, (5) Bhopal, (6) Saurashtra, (7) Tripura, (8) Manipur, (9) Coorg, (10) Travancore-Cochin.

Pakistan—(1) Chitral, (2) Dir, (3) Swat, (4) Bahawalpur, (5) Khairpur, (6) Las Bela.

N.B.—The confines of India and Pakistan on the side of Kashmir have still to be determined.



INDIA BEFORE PARTITION IN 1947

tion of their water for the more pressing needs of irrigation. The decrease in importance of river transport (except in the delta) has led to the decay of many of the old river ports unless they also serve the newer purpose of railway centres. The flatness of the surface has greatly facilitated the construction of railways, but one must bear in mind that this very flatness creates difficulties in protecting the land adjoining the railway embankments in the rainy seasons. The number of rivers to be crossed necessitates great expense in bridging, and in the wetter regions the vigour and rapid growth of vegetation, and in the drier regions the dust storms, add to the expense of maintenance.

In the mid-Ganges basin railways have almost superseded water carriage, even in the case of heavy goods. In the delta of the Ganges and Brahmaputra, which furnishes an unsurpassed system of water communications, the network of railways is not so close, and the Brahmaputra still forms the main highway to the north-east. The Indus, owing to frequent shiftings of its bed and accumulations of sand, is difficult to navigate, and steamer traffic on it has ceased.

Apart from 3,000 miles of light lines, India's 34,000 miles of railways are almost equally divided between broad gauge (5ft. 6in.) and metre gauge lines. Three-fourths of the whole are State-owned. Pakistan's 6,700 miles, mostly in west Pakistan and mostly broad gauge, are wholly State-owned. One disadvantage of the differences of gauge—the resulting prevention of intercommunication between lines on different gauges without break of bulk—is obvious. But it will be observed that this drawback is at least mitigated by two notable facts—that there are interconnected lines on the broad gauge from Peshāwar in the north to Calicut in the south, and that there are extensive interconnected systems on the metre gauge, both in the north and the south. But it is also to be noted that narrow gauge railways are necessarily less efficient than those on a broad gauge, not only because of the smaller capacity of the wagons, but also because the speed on them is less.

The broad-gauge railway in the North West, which was carried as far as Jamrud at the entrance to the Khyber Pass about the beginning of the present century, was continued through the pass to the Afghan frontier and opened in 1925. There are also a number of mountain railways on narrower gauges (2ft. 6in. and less).

In the peninsular portion of India the nature of the surface has placed special difficulties in the way of communication between the coast and some of the richer plains or depressions of the tableland in the interior. The rivers in times of flood are too impetuous, at other seasons most of them are too scantily supplied with water to be navigable except near their mouths, and even where they are navigable higher up, their navigation is impeded by rapids occurring where they break through the mountains bordering the plateau.

Not only so, but they mostly break through these mountains in gorges too narrow or country too wild to be easily traversed by roads or railways. On looking at a physical map of India one might expect the valley of the Narbadā, continued by that of the Son, a tributary of the Ganges, to form a natural line of communication between the Gulf of Cambay and the valley of the Ganges; but this is prevented by the existence of rugged forest country on the lower part of the Narbadā, and wild country in the upper two-thirds of the valley of the Son. Hence the railway that now passes through the most fertile expanse of the valley of the Narbadā, between the Vindhya Hills on the north and the Sātpura Hills on the south, enters this valley by a diagonal route from Bombay, and leaves it near the head of the valley of the Son, then striking north-eastward to Allahabad. So, too, a series of fertile depressions of the tableland is cut off from the coast by wild and difficult country on the lower part of the Tāpti, and this region is hence reached by a branch of the same railway that proceeds from Bombay to the valley of the Narbadā. A similar depression in the upper basin of the Mahānadi was opened up by rail only in the early part of 1916, with the result that land which had brought a rent of 4*d.* an acre yielded excellent crops of cotton, ground-nuts, and sugar-cane, and a rent of 13*s.* an acre. The railway, completed in 1933, from Raipur to Vizagapatam, in conjunction with the new harbour at Vizagapatam, had similar beneficial results. To gain the surface of the tableland from Bombay, the railway has to cross a pass called the Thāl Ghāt, more than 1,900 feet in height. Communication between Bombay and Madras, across the Deccan, has been effected since 1863 by means of a railway up the Bhor Ghāt, a pass about a hundred feet higher than the former, and much more difficult. The carriage-road up this pass, completed in 1830, itself a remarkable engineering achievement, formed the first good means of communication between Bombay and the interior.

A third railway crosses the Western Ghāts about the middle, serving to connect the Portuguese port of Goa with the fertile district of Dhārwar, and through that with Madras; but south of this there is no other railway across the peninsula till we come to the remarkable depression known as the Pālghāt Gap. This important physical feature lies immediately to the south of the Nīlgiri Hills, a group of small but high plateaus in the south of the Deccan at the angle where the Western and Eastern Ghāts approach nearest to one another. The highest elevation of the gap is a little more than 1,000 feet above the sea, and the opening which it forms is all the more striking from the fact that it separates mountains rising to nearly 9,000 feet in height both on the north and south. The southern mountains (the Cardamom Hills) extend to the southern extremity of the peninsula, occupying the greater part of the state

of Cochin-Travancore. Through the gap between them and the Deccan runs the railway from Madras to Calicut and the modernised port of Cochin. With the great distances which are involved India and Pakistan have come to make great use of air transport, both internally and internationally.

INDIA: IMPORTS AND EXPORTS, 1951-2

*Based on the United Nations Yearbook of International Trade Statistics.
Sterling value of the Indian Rupee, 1s. 6d. Rate of exchange, Rs.13½ = £1.*

IMPORTS BY COMMODITIES				EXPORTS BY COMMODITIES			
General Imports, c.i.f.	Total ¹	Million Rs.		National Exports, f.o.b.	Total ²	Million Rs.	
		8,602 (£645m.)				7,016 (£526m.)	
<i>Principal Commodities:</i>				<i>Principal Commodities:</i>			
Wheat		1,520 (17.7%)		Jute manufactures		2,602 (37.1%)	
Rice (husked)		382 (4.4%)		Tea		934 (13.3%)	
Other grains, flour, pulse,		379 (4.4%)				3,536 (50.4%)	
Spices, dates, preserved milk		162 (1.9%)					
		2,443 (28.4%)		Raw cotton and waste		210 (3.0%)	
Raw cotton		1,365 (15.9%)		Cotton yarn and piece goods		537 (7.7%)	
Raw wool		26 (0.3%)				747 (10.7%)	
		1,391 (16.2%)					
Yarns and fabrics (cotton,		330 (3.8%)		Manganese ore		158 (2.3%)	
woollen, synthetic)		1,091 (12.7%)		Mica		132 (1.9%)	
Machinery, vehicles and parts		692 (8.0%)		Coal		78 (1.1%)	
Mineral oils: kerosene, etc.		350 (4.1%)				368 (5.3%)	
Metals: iron, steel, etc.		349 (4.1%)		Hides and skins		293 (4.2%)	
Chemicals and drugs		166 (1.9%)		Spices (mostly pepper)		277 (3.9%)	
Dyeing and tanning substances		140 (1.6%)		Vegetable oil seeds and oils		246 (3.5%)	
Printing and other paper				Tobacco		168 (2.4%)	
				Lac		148 (2.1%)	
Total of all above items		6,952 (80.8%)		Total of all above items		5,783 (82.5%)	

IMPORTS BY COUNTRIES				EXPORTS BY COUNTRIES			
General Imports, c.i.f.	Total ³	9,406 (£705m.)		National Exports, f.o.b.	Total ⁴	7,287 (£546m.)	
<i>Countries of Production:</i>				<i>Countries of Consumption:</i>			
United States		2,879 (30.6%)		United Kingdom		1,877 (25.8%)	
United Kingdom		1,578 (16.8%)		United States		1,299 (17.8%)	
Pakistan		875 (9.3%)		Australia		466 (6.4%)	
Egypt		404 (4.2%)		Pakistan		452 (6.2%)	
Iran		290 (3.1%)		Burma		196 (2.7%)	
Germany		283 (3.0%)		Argentina		175 (2.4%)	
Japan		246 (2.6%)		Ceylon		163 (2.2%)	
Burma		233 (2.5%)		Malaya		156 (2.1%)	
Malaya		221 (2.3%)		Japan		142 (1.9%)	
				Hong Kong and China		119 (1.6%)	
Total of above		7,009 (74.5%)		Total of above		5,207 (71.3%)	

¹ Trade by land not included. Total revised to Rs.8,636m. The unrevised total is retained in the table because the separate items are related to it.

² Including trade by land, Rs.804m. (£60m.), of which jute imports from Pakistan accounted for Rs.670m. (£50m.). The total has been revised to Rs.9,433m. See last sentence under Note 1.

³ Trade by land not included. Total revised to Rs.7,019m. See last sentence under Note 1.

⁴ Including trade by land, Rs.271m. (£29m.). Total revised to Rs.7,291m. See last sentence under Note 1.

Commerce. Until the First World War one of the striking features of Indian foreign commerce was the large excess of imports of bullion and specie. This resulted in the steady accumulation of specie (formerly silver, later chiefly gold) in the country. From 1931

onwards, however, the rise in the price of gold, expressed in terms of the Indian rupee, led to an enormous export of treasure though probably only a small part of the accumulated hoards. At the same time this points to an increased confidence in the banking system.

PAKISTAN: IMPORTS AND EXPORTS, 1951-2

Based on the United Nations Yearbook of International Trade Statistics.

Sterling value of Pakistan Rupee, nearly 2s. 2d. Rate of exchange P.Rs. 9·27=£1.

IMPORTS BY COMMODITIES			EXPORTS BY COMMODITIES		
General Imports, c.i.f.	Total ¹	Million P.Rs. 1,712 (£185m.)	General Exports, f.o.b.	Total ²	Million P.Rs. 2,300 (£248m.)
<i>Principal Commodities:</i>			<i>Principal Commodities:</i>		
Textile goods: Cotton		591 (34·5%)	Raw jute		1,208 (52·5%)
Woolens and worsteds		11 (0·6%)	Raw cotton		741 (32·2%)
Artificial silk		56 (3·3%)	Raw wool		45 (2·0%)
Jute (gunny)		18 (1·1%)	Hides and skins		37 (1·6%)
			Tea		51 (2·2%)
		676 (39·5%)			
Vehicles, machinery and parts		188 (11·0%)	Total of above items		2,082 (90·5%)
Iron and steel		126 (7·4%)			
Sugar, spices, fruits, etc.		95 (5·5%)			
Copra and coconut oil		24 (1·4%)			
Mineral oils: kerosene, etc.		89 (5·2%)			
Chemicals, drugs, medicines		49 (2·9%)			
Dyes, paints, varnishes		36 (2·1%)			
Printing and other paper		33 (1·9%)			
Cutlery		29 (1·7%)			
Total of all above items		1,345 (78·6%)			

IMPORTS BY COUNTRIES			EXPORTS BY COUNTRIES		
General Imports, c.i.f.	Total ³	1,584 (£171m.)	General Exports, f.o.b.	Total ⁴	1,750 (£189m.)
<i>Countries of Production:</i>			<i>Countries of Consumption:</i>		
Japan		428 (27·1%)	United Kingdom		307 (17·5%)
United Kingdom		341 (21·5%)	Japan		236 (13·5%)
United States		106 (6·7%)	France		200 (11·4%)
Italy		104 (6·6%)	China		133 (7·6%)
India		97 (6·1%)	Italy		130 (7·4%)
Hong Kong		63 (4·0%)	Germany		124 (7·1%)
Germany		54 (3·4%)	India		75 (4·3%)
China		43 (2·7%)	Belgium		75 (4·3%)
Belgium		40 (2·5%)	United States		71 (4·1%)
Malaya		30 (1·9%)	Hong Kong		63 (3·6%)
Ceylon		29 (1·8%)	Poland		58 (3·3%)
France		28 (1·8%)	Spain		29 (1·7%)
Total of above		1,363 (86·1%)	Total of above		1,501 (85·8%)

¹ Sea and air trade; not including imports by land (P.Rs.217m.).

² Exclusive of land trade. Revised total P.Rs.1,712·5m. Unrevised total retained in table because the separate items are related to it.

³ Including both sea and air trade (P.Rs.1,750m.) and land trade (P.Rs.550m.).

⁴ Sea and air trade only.

During the First World War the commerce of India was necessarily greatly affected by the obstacles to communication with the West, and also by the exceptionally great increase during that war and in the year or two following in the prices of the raw produce that made up the bulk of Indian exports. This latter fact is the chief explanation of the increase in the proportion by value of the

goods sent to the United Kingdom from an average of 25 per cent. per annum in the period 1909-14 to 31 per cent. in the period 1914-19, and to 36 per cent. in the year 1919-20, while the subsequent fall in prices accounts for the decline in the British share to 20 per cent. in 1921-22. Later, the proportion increased again to 31.7 per cent. in 1931-35, the last quinquennium to include Burma as an Indian province. Meantime the principal advance in proportion was that of Japan, which received in the period 1909-14, 7 per cent., in the year 1919-20, 14 per cent., and in 1921-22 (after a decline to 9 per cent.) 16 per cent. of the value. The decline of Great Britain's share in supplying the imports from 63 per cent. on the average of the years 1909-14 to 56 per cent. in 1914-19, is easily understood. Her lowest percentage was in 1919-20 (51 per cent.). In 1921-22 it amounted to 57 per cent., but in 1931-35 it averaged only 38.3 per cent., and has since fallen much lower.

In the inter-war years there was abundant evidence in the trade returns that India had little to spare of agricultural produce—the export of wheat virtually ceased—whilst home manufactures in textiles, iron, and steel affected the former huge import. In 1938-39, with Burma gone, imports of private merchandise were valued at Rs.1,523m. (£114m.), and exports of Indian produce at Rs.1,628m. (£122m.). Imports were largely rice, mineral oils, cotton piece goods, machinery and vehicles. Chief exports were jute manufactures, raw jute, raw cotton, tea, and oil-seeds (mainly groundnuts), these items making up two-thirds of the total. Britain was the best market for tea and jute, continental Europe took most of the oil-seeds, and Japan much of the cotton.

Since the partition of 1947, the position broadly has been that while Pakistan is relatively well endowed with primary agricultural produce—raw jute, cotton, and even grain—the basis of manufacturing industry in coal and minerals generally remains in the Republic of India. Though most of the raw jute is produced in eastern Pakistan, most of the factories are on the Hooghly north of Calcutta (p. 213). The latest available figures for the trade of both countries are shown in the tables on pp. 566 and 567.

Seaports. The foreign sea-borne commerce of India and Pakistan is concentrated in four seaports—Calcutta, Bombay, Madras, and Karāchi, and nearly 80 per cent. of the whole falls to the share of the first two. Since partition Chittagong has increased greatly in importance as the ocean port of eastern Pakistan.

Calcutta, on the Hooghly, an arm of the delta of the Ganges, is the last of a succession of ports which have flourished on the same stream. The others, all of which stood higher up, have declined in consequence of silting, and the same fate is averted from Calcutta only by great engineering works. Founded in 1686, the town was made the seat of government of Bengal in 1772, and of British India

in the year following. It remained the official capital of the Indian Empire till October 1, 1912, when it was replaced by Delhi.

Bombay—by far the most important seaport in the west of India, and the rival of Calcutta in commerce and shipping—is likewise a town of recent origin, and a port that has had great predecessors in the same district. The predecessors of Bombay as a seaport were Broach, near the mouth of the Narbadā, and Surat, near the mouth of the Tāpti; and the history of the three illustrates in an interesting manner the relation between physical features and commercial development. Broach is the oldest of the three. Under the name of Barugaza it is one of the oldest Indian seaports known in commerce with the East or West. Yet it seems always to have had a poor harbour, very difficult to approach. Its difficulty of access is at least mentioned as far back as the first century A.D. But in days when vessels were very small, and navigation slow, the shallowness of the river-mouth and the delay in entering were of very little consequence; and the mouth of the Narbadā has the advantage of possessing high banks out of the reach of flooding, and being contiguous to a highly productive region. Surat shares with Broach the last-named advantage, and it has much better accommodation for shipping. The Swally (Suwālī) Roads, north of the mouth of the Tāpti, afford a safe anchorage even for large vessels from October to April, though it is dangerous for such vessels during the prevalence of the south-west monsoon. The banks of the Tāpti, on the other hand, are low and liable to inundation, a disaster which has more than once overtaken the town. The advantage of the harbour, however, began to prevail in favour of Surat in the sixteenth century, when direct commerce with Europe had begun. The Portuguese, the Dutch, and the English established factories (that is, trading stations) here, and in the seventeenth and eighteenth centuries Surat was the greatest seat of foreign commerce, and, latterly at least, the most populous town in India. Bombay, built on a small island, now connected, along with another larger island (Salsette) behind it, with the mainland, has the immense advantage over both its predecessors of possessing a harbour safe for large ocean-steamers in all weathers; but it had the misfortune to be backed by mountainous country, which cut it off from the more productive regions beyond. In 1661 Bombay Island was acquired by Charles II from the Portuguese, and in 1687 the East India Company, to which it had previously been handed over, transferred thither, from Surat, the headquarters of their possessions; but it was not till after the establishment of the improved communications with the interior mentioned above that Bombay rose to the commanding position it now holds in the commerce of India. Its two famous predecessors are now visited only by coasting vessels, but the inland trade of Surat is still important.

Karāchi, since 1947 the capital of Pakistan, stands on a small bay to the west of the mouths of the Indus, and has been provided with a splendid harbour. Its wheat trade especially grew with remarkable rapidity after the planting of the irrigation colonies in the north-west, but later was replaced by cotton. In addition to its function as port and capital it has become the front door into the sub-continent for air traffic from Europe.

Most of the other seaports of the west coast have only fair-weather harbours—safe in our winter months, but rendered dangerous by the heavy surf during the prevalence of the south-west monsoon. The harbour of Goa (Portuguese) is an exception, and the trade there, which had dwindled, revived after Mormugão, at the south-west extremity of the harbour, was connected by rail with the interior. Calicut, which has an anchorage 24 feet deep at low-water spring-tides, and Cochin, which had a harbour available for ships of no more than 15-feet draught, retained some importance in connection with the trade in pepper and spices, which drew the Portuguese to these ports at the end of the fifteenth century. Cochin has now been dredged to form a deep-water harbour.

The extraordinary importance of the trade in pepper and spices in past times it is difficult for us now to realise. The quantities that reached Europe were small compared with those which make up the trade of the world in such commodities at the present day, but the differences in value at the place of origin and in Europe enabled those merchants who escaped the risks of the trade to reap enormous profits. The cargoes brought back by Vasco da Gama after the voyage on which he discovered the sea-way to India, were mainly of spices and pepper, and they are stated by Correa, the Portuguese historian of the voyage, to have yielded a profit on the voyage of 6,000 per cent. In Thomas Mun's *English Treasure by Forraign Trade*, written about 1630, the price of pepper in the East Indies is stated to have been 4*d.* a pound when it was 20*d.* in England. By contrast in the early part of the present century the average price of pepper at Bangkok was a little more than 7*d.*, when it varied from 8½*d.* to 9½*d.* in the London market. As to the risks of the trade in past times, see p. 96.

The south-east coast of India, where a low plain slopes gently out under a shallow sea, did not possess a single safe natural harbour, or navigable river-mouth. Ships anchored off the shore at several roadsteads, and goods and passengers had to be landed in flat boats through surf. By virtue of harbour works, Madras has been made a seat of great trade, a trade, however, of less than one-sixth of the value of that of Bombay, notwithstanding the populousness and productiveness of its hinterland, and even this has been achieved only by waging a constant struggle against natural conditions. The site of the city was ceded to the English East India Com-

pany in 1639, when Fort St. George was erected there. About a hundred years later Madras was already the most populous city in southern India. Down to the latter part of the nineteenth century, however, the trade was carried on in the same manner as at the other ports on this coast. In 1881 a harbour was nearly completed, when it was in great part destroyed by one of those irresistible hurricanes by which both sides of India are liable to be swept, especially about the change of the monsoons (May and October), and which on the eastern side raise the waves to a height unparalleled elsewhere. A new harbour was, however, completed in 1895, two moles of about 3,900 feet in length being run out seawards leaving an opening of 515 feet between them; but great difficulty is experienced in keeping it dredged owing to the enormous quantities of sand drifted northwards and southwards by the monsoon currents.

The voyage from Madras to Europe or the reverse is considerably lengthened by the necessity of passing round the island of Ceylon, which is nearly connected with the mainland by a string of islands and a shallow bank known as Adam's Bridge. The long-discussed proposal for connecting India with Ceylon by rail by this route was abandoned in favour of a part-rail part-steamer connection, which was established early in 1914. Only one channel, called the Pāmbam (Paumben) Passage, across this 'bridge' has been sufficiently deepened to allow of its being used by good-sized coasters, and it is doubtful whether it can ever be made navigable for large ocean-going vessels.

The lesser Indian seaports include Cocanāda, at the end of one of the canals of the delta of the Godāvāri, and Tuticorin, in southern Madras, on the Gulf of Manar, this last having a harbour 12 feet deep at low water, which enables it to carry on a considerable export trade. The completion of the fine harbour of Vizagapatam in 1933 placed that port among the leading ones of India.

Landward trade. The landward foreign trade of India and Pakistan (see footnotes to tables on pp. 366–67) is only a small fraction—5 to 10 per cent.—of the trade by sea and air. The trade through the western passes makes up about 20 per cent. of the whole landward trade.

The partition of India in 1947. When the British withdrew from India in August 1947, two separate states were set up, primarily on a religious basis. Pakistan is essentially Muslim, the Republic or Union of India primarily Hindu. At that time Pakistan had an estimated population of 71m. and an area of 361,000 square miles; India 337m. people on 1·22m. square miles. Pakistan is in two parts separated by a thousand miles of Hindu territory. Eastern Pakistan comprises much of the delta of the Ganges-Brahmaputra—rice- and jute-growing land—some two-thirds of the former province of Bengal, together with adjoining land formerly in Assam. Western

Pakistan comprises half the former province of the Punjab (now West Punjab with Lahore as the chief town), the North-west Frontier Province, Sind, and Baluchistan. The Union of India embraces the remainder (except the disputed territory of Kashmir) and the old distinction between 'British India' and 'Indian India' or native states has disappeared; speaking generally, the former rulers of states have become pensioners of the Central Government. Many of the small states have been compulsorily united to form larger units. Some of the old provinces (all officially now known as states) have been renamed and other changes are planned.

Inland cities and towns of the Republic of India. Delhi, the capital of India, lies between the great irrigation province of the East Punjab and Uttar Pradesh, formerly the United Provinces (Ganges Plain). The district has been constituted a small province. Delhi is a city of about a million and owes its importance largely to its position—from which all parts of the country are readily accessible. In the past when India was invaded from the north-west, Delhi had to be passed since it commanded the easy route lying between the Himalaya Mountains on the north and the plateau on the south. In the old days the land routes of the north-west joined here the water routes of the Jumna and Ganges. Now Delhi has become a railway junction. The cotton of the neighbouring irrigated lands finds its way to mills at Delhi. At a convenient distance to the north are the healthy heights of the Himalayas, on a spur of which stands Simla, for long India's summer capital. West of Delhi, the East Punjab includes the famous Sikh city of Amritsar.

Going down the broad Ganges plain to the east, the traveller passes through Uttar Pradesh. Here Agra, formerly one of the great cities of the Mogul Empire and famed for the Taj Mahal—perhaps the finest building in India—lies on the River Jumna. Farther east the former provincial capital, Allahabad, is at the junction of the Jumna and the Ganges. In the Ganges-Jumna 'Doab' (the land between the rivers) between Allahabad and Delhi is Aligarh, a collecting centre and famed for the dairying industry elsewhere so markedly absent in India. Above Allahabad on the Ganges is Kanpur (Cawnpore), to the north. The State capital of Uttar Pradesh is now Lucknow. Below Allahabad, Banaras (Benares) is a Hindu cultural centre on the Ganges.

Eastward is the Province (now State) of Bihar with Patna on the Ganges which has given its name to Patna rice. In Western Bengal there are several large jute-mill towns on the Hooghly north of Calcutta. On the western border of Bengal is the coal-field. On the healthy heights of the Himalayas to the north of Bengal lies the hill station of Darjeeling.

In Peninsular India Jubbulpore and Nagpur, both in Madhya Pradesh (Central Provinces), have cotton mills. Farther south

Hyderabad, the fourth city of India, is capital of the state of the same name (the Nizam's Dominions). Bangalore and Mysore are the chief towns of Mysore. In Madras, Ootacamund is the hill station (in the Nilgiri Hills), Trichinopoly and Madura are old cities of the south.

Towns and cities of Pakistan. The delta lands of Eastern Pakistan are thickly populated but the towns are small, most of the people living in villages amid the rice and jute lands. Dacca is the chief town, unlike Calcutta an old settlement.

In Western Pakistan the Province of West Punjab includes the capital of the province, Lahore, and Rawalpindi. Multan is the central town of the very dry south-west. Between the Punjab and the frontier with Afghanistan lies the North-West Frontier Province with the famous irrigated valley around Rawalpindi, leading to the historic Khyber Pass. The Province of Sind, occupying the lower valley of the Indus, has been transformed by irrigation. A large inland city is Hyderabad (not to be confused with the south India city of that name), but the capital and port of Karāchi has eclipsed all in its growth.

Baluchistan is composed mainly of arid and unproductive tablelands inhabited by scattered tribes. The settled areas in the north-east lie around Sibi and Quetta, which are largely the creations of British rule. Quetta (5,500 feet) is connected with Sind by a railway with one loop running eastwards up the Nari Pass, and another (with gradients of 1 in 24) up the Bolan Pass. The idea of opening a trade-route from Quetta through northern Baluchistan with Sistān and Meshed in Khurastan (Iran), a distance of more than 1,000 miles, was long entertained. A caravan-route was at last established about 1898, but the trade by that route, though it grew rapidly, remained insignificant. Later the railway was carried westwards from Quetta through Nushki to Duzdap within the Iranian (Persian) frontier, and though of strategic interest, the traffic remained so insignificant that the railway is now disused.

Kashmir is the westernmost of the states traversed by the Himalayas, and is mainly composed of lofty mountains. It includes, however, the lovely valley of the same name lying, at the height of rather more than 5,000 feet, in a latitude corresponding to that of northern Morocco. Srinagar, on the Jhelum in this valley, is the largest town (250,000) and the centre of trade, the whole volume of which is also equal to about 20 per cent. of the landward trade of India. From Srinagar there are several routes both south to the Punjab (the chief route being that leading to Amritsar) and north to the valley of the Indus: and from Leh, in the valley of the Indus in the east of Kashmir, a trade-route diverges northwards to eastern Turkistan, across the highest pass in the world so crossed. This is the well-known Karakoram Pass, 18,500 feet in height—that is,

upwards of 6,000 feet higher than Leh, and upwards of 15,000 feet higher than the towns of eastern Turkistan. When the partition of India took place in 1947 Kashmir provided a seemingly insoluble problem. Most of its people are Moslems, and it holds the headwaters of the streams supplying Pakistan with precious irrigation water. Its natural union was with Pakistan, but its rulers were Hindus and they acceded to India. A republic was proclaimed in 1952, but the problem still awaits solution.

With *Sikkim*, *Bhutan*, and the north-eastern states beyond the frontier of Bengal and Assam, trade is very trifling. Trade could be developed with Tibet by a series of passes in Sikkim, about 13,000, 14,000, and 15,000 feet high respectively. On the Indian side they are within a short distance of the railway to Darjeeling.

Nepāl. The native state of Nepāl, entirely independent of India, the populous parts of which lie south of the main range of the Himalayas, and have many routes to the Indian plains, absorbs more than half the landward foreign trade of India. The chief imports therefrom are food grains, oil-seeds, timber, cattle, and horns. From Kātmāndu, the capital, two routes branch over the central range of the Himalayas, and by means of these a small trade is carried on with Tibet. Nepāl is an interesting country ruled until 1951 (when a more democratic constitution was adopted) on military lines by a family of Hindu Rajputs, the people of the country being the Gurkhas, one of the world's most famous military races. The country was for long virtually closed to Europeans, slavery was only abolished in 1924-26, and the first telephone was installed in 1927.

Possessions of European Powers in India. Of the once widespread possessions of France only a few big tracts remain of which the chief are Pondicherry and Karikal. The Portuguese territory of Goa is larger and Portugal still holds Daman and Diu.

TOWNS OF INDIA, 1951

Calcutta (including Howrah)	3,599,000	Poona	491,000
Bombay	2,839,000	Cawnpore (Kanpur)	705,000
Madras	1,416,000	Agra	376,000
Hyderabad	739,000	Nagpur	449,000
Delhi	915,000	Benares (Banaras)	356,000
Ahmedabad	788,000	Allahabad	332,000
Lucknow	499,000	Madura	362,000
		Patna	282,000

TOWNS OF PAKISTAN, 1951

Karachi	1,126,000	Rawalpindi	237,000	Peshawar	152,000
Lahore	849,000	Multan	190,000	Chittagong	146,000
Dacca	276,000	Lyallpur	179,000	Gujranwala	121,000
Hyderabad	242,000	Sialkot	168,000	Quetta	84,000

THE INDO-CHINESE PENINSULA

The peninsula of Indo-China, formerly called Further India, lies between India and China. To the south, linked with it by the Isthmus of Kra, is a long narrow subsidiary peninsula, called the Malay Peninsula or Malaya. The heart of the main area and stretching southwards to include the isthmus is occupied by the independent Kingdom of Siam or Thailand. To the west lies Burma, once an independent empire or empires but gradually absorbed to become a province of the British Indian Empire, now since 1948 an independent republic. To the east of Siam lie the states which as colonies or protectorates formed French Indo-China. Still within the framework of the French Union these have been regrouped since the end of the Second World War into the Empire of Viet-Nam (uniting the former Tonkin, Annam, and Cochin-China), the Kingdom of Laos, and the Protectorate of Cambodia. Malaya is now a federation of nine Moslem Malay States and two British settlements, whilst the island of Singapore at its southern end is a British Crown Colony.

Taking the peninsula as a whole, the mountainous character of a large part of the country, especially the north to south alignment of the mountains, the existence of numerous extensive swamps in the more level tracts of the interior, and the defectiveness of the communications, go a long way to account for the low density of population, but among other causes have been devastating wars, inroads of robber bands from the mountains, and other consequences of the want of strong government. While Burma was in the hands of the British, there was a constant stream of settlers southwards and westwards, as well as of emigrants from India, and population, production, and commerce rapidly increased. Owing to the scantiness of population relatively to the resources of the territory Burma is still to some extent in the position of a new country. Similarly the possibilities of expansion in French Indo-China, Siam, and Malaya have led to a huge influx of Chinese. This led, when security and a market were offered, to the rapid occupation of the land for the raising of export produce, notably rice and, in Malaya, rubber.

BURMA

Modern Burma has had a chequered career. Till April 1937 it was one of the provinces of the Indian Empire; it was, in fact, the

largest, having an area of a quarter of a million square miles, but was markedly contrasted to the remainder of India in that the population of this vast area was only a little over 15m. The separation gave point to the marked contrast between Burma and India proper, for the position of the 'Cinderella' province had long been an anomalous one. Burma was invaded by the Japanese in December 1941 and occupied by them until 1945. By friendly agreement and a treaty signed in London in 1947 Burma (under the title of the Union of Burma) became an independent republic, outside the Commonwealth, on January 4, 1948. Unfortunately armed strife between different racial groups and the spread of bands of dacoits or robbers halted all progress. Burma can be described as an undeveloped monsoon country with great possibilities of expansion and economic activity. Its problems include those connected with immigration of people from over-populated India on the one hand, and over-populated China on the other. It is, however, cut off from India by a wall of mountains and from the thickly populated parts of China by a broad expanse of plateaus and mountains, so that almost the only approach to the country is by sea through its major port of Rangoon or more recently, for special purposes, by air. It is this remarkable isolation from its neighbours that left Burma in the position of a pleasant but undeveloped backwater. Until the Japanese invasion the quickest way from Assam to northern Burma, a distance of 100 or 150 miles across the mountains in a straight line, was *via* Calcutta round to Rangoon, up the Irrawaddy and so to complete the journey in about ten days. The motor roads which the British and American armies built across the mountains when they drove out the Japanese in 1945 have again fallen into disuse.

In its physical build the remarkable feature of Burma is the north-south alignment of its ranges and its principal river valleys. From west to east there is first the complicated folded mountain chain of the Arakan Yoma, between which and the sea, the Bay of Bengal, there are but small plains suitable for the support of a population, the most extensive being around the town of Akyab. At present no railway or motor road crosses these mountains. Then comes the valley of the Chindwin, somewhat narrow and sparsely populated, which is extended southwards into the valley of the lower course of the Irrawaddy. The valley of the lower Irrawaddy, through the heart of the Dry Belt, is broad and supports a considerable population, whilst the fertile delta of the Irrawaddy is also a very important part of the country. Then comes another line of mountains from north to south, much lower in the south, where it forms the forested ridge known as the Pegu Yoma; this line of mountains is breached about the centre by the Irrawaddy river. Then comes the valley of the upper course of the Irrawaddy (as far as Mandalay) and the continuation of the valley southwards

now drained by a smaller stream, the Sittang; both these valley regions are important. The whole of the east of the country is occupied by a broad plateau, the Shan plateau, through which runs the deep cleft occupied by the Salween river. The Shan plateau is continued southwards into broken forested country, towards Tenasserim and the Malay peninsula.

Structurally Burma falls into two parts: the western half with its valley plains and its folded mountains, of comparatively recent geological age, and the eastern half which consists of a great block of ancient rock, including many metamorphic rocks, tracts of limestone and other areas which are most important because of their yield of minerals. In the western half of the country, in the valley of the Chindwin and the Irrawaddy, is a succession of oil-fields, so that Burma before 1941 was the rival of Trinidad as the largest producer of oil in the British Empire, with a total production then about 0·6 or 0·7 per cent. of the world's total. The two leading fields are Singu and Yenangyaung, both near the River Irrawaddy. The oil is normally sent from these fields by pipeline over 300 miles to the refineries near Rangoon. Burmese oil is rich in volatile constituents and is largely refined for its yield of petrol rather than used as crude oil. There is not much possibility of the further discovery of oil in Burma, but the fields that exist have been very carefully worked. In the eastern half of the country one finds in the north the famous old Burma ruby mines, but the drop in the value of rubies and the growth in the manufacture of artificial rubies have led to the virtual disappearance of the mining of gem stones. Not far away is one of the largest silver-lead mines in the world, that of Bawdwin with its refinery or smelting works at Namtu, operated until 1952 by the Burma Corporation. The minerals produced here are sent by rail to Rangoon. Other mineral deposits are known to occur in the Shan Plateau, but many of them are too inaccessible to be worked at present. In the south of the country, however, in Tenasserim particularly, one finds the tin and tungsten deposits, some worked in the alluvial valleys, some as lode deposits, which fluctuate in importance according to the world price of tin.¹

Climatically Burma has the same monsoon climate as India. The position of the Tropic of Cancer should be noticed: it passes through Burma in such a way that about a third of the country lies outside the tropics, the remainder within. Thus in the cool season there is a gradual decrease in temperature as one goes from the south of the country where it is really always hot and moist, towards the north, where even in the valleys frosts may occur in January. The really important point about Burma is the way in which the mountain ranges of the west and the Irrawaddy delta catch the full

¹ It should be understood that any working of minerals since the Japanese invasion of 1941 has been small and spasmodic.

force of the monsoon, and so in places may enjoy, or rather suffer from, a rainfall of as much as 200 inches. Most of the great rice region of the delta has a rainfall of about 100 inches—this is the total received by Rangoon. In the heart of the country, which is sheltered from the rain by the surrounding mountains, the rainfall may drop to as low as 20 inches, resulting in semi-desert conditions. Thus within a limited area there is an enormous range of climatic conditions with a corresponding range in products.

Similarly the natural vegetation of Burma ranges from the dense equatorial type of forest in the wettest regions, a type of forest which is little exploited because of the variety of trees, but which to a considerable extent has been destroyed by the indigenous shifting cultivation, through the very important teak forests where the rainfall is between 40 and 80 inches a year. In normal times timber, particularly teak, forms the second most important export of the country. It must not be supposed that these forests consist entirely of teak trees: teak does not as a rule constitute more than 15 per cent. of the total. The forests, which belong to the group of the monsoon forests, lose their leaves as a protection against the great heat of the hot season. The drier parts of the country have too little rainfall for the adequate growth of forest and are covered with almost useless scrub. A yellow dye, known as 'cutch,' is made from the acacia trees of part of this belt.

In all the wetter parts of the country rice is the great crop, particularly in the Irrawaddy delta and the smaller delta and valley of the Sittang, together with the limited tracts of flat land along the coasts of Arakan and Tenasserim. Burma rice is not of the highest quality and is used in the European market more for industrial purposes than for human food. Burma is, however, with Siam and French Indo-China, normally one of the great rice-exporting countries of the world, and rice constitutes easily the largest export. The grain is taken by 'paddy' boats through the creeks or canals of the delta to Rangoon or to Bassein, where in the rice mills the husks are removed and the rice exported. The Japanese invasion of 1941 cut off the markets; subsequent disturbed conditions led to the abandonment of much land, so that recovery must be slow.

In the Dry Belt of Burma there is a certain amount of irrigation, but much opportunity exists for more. The Dry Zone crops are the usual millet and sesamum, together with a certain amount of cotton and the very important crop, ground-nuts.

The population of Burma now estimated at about 19m. includes over a million belonging to hill tribes who constitute the sparse population of the Shan plateau and the hills, and are also found in isolated groups elsewhere, notably the Karen villages of the delta. They are interesting but, except the Karens, are economically unimportant. Except in the delta they are normally organised into native

states under the rule of their own chiefs. Then about another million of the population consists of immigrants. In the first place there are the 300,000 Chinese who came to the country mainly to form a sort of middle class consisting of artisans, office clerks, shopkeepers, and so on. The Chinese penetrated up-country to the villages and intermarried with the Burmese. There are in Burma practically no Chinese coolies. Coolie labour is or was performed by the immigrant Indians, who were to be found in large numbers working on the docks in Rangoon and up-country on the railways or near main lines of communication. They had a lower standard of living than the native Burmans, and tended to complicate the life of the country by thus 'undercutting' the natives. In 1941 Indian immigrants and residents numbered about 800,000. Many left when the British withdrew in face of the Japanese invasion: many were massacred. The remaining people, the great majority, belong to the Burmese race. The Burmans are Mongols allied to the Chinese or the Malays, and by religion they are Buddhist. Sporting, gentlemanly, with a natural sense of humour, the Burmese are delightful people possessed of good brain power but frequently lacking the concentration or devotion to hard work which is necessary in this modern, sordid world and hence liable to suffer from the competition of the Indian on the one hand or the Chinese on the other.

The country has a metre-gauge railway system which connects Rangoon, the capital and chief port, with Promé, the port on the Irrawaddy to the west and with Mandalay *via* the Sittang valley. Mandalay is about the same distance from Rangoon as Edinburgh is from London. A fine rail and road bridge was built across the Irrawaddy near Mandalay (destroyed during the Japanese invasion) and the railway runs considerably farther north and has branches up into the hills. The main highway of Burma is still, however, the River Irrawaddy, which is navigable for a thousand miles from its mouth. Its chief tributary, the Chindwin, is also used. Regular services of the Irrawaddy Flotilla Company ran up and down the river and carried much traffic. There is much river traffic, too, in the delta as well as on other rivers in Burma. A great proportion of the timber for the saw-mills of Rangoon is brought down by raft.

Notice the position of the old capital of the country (Mandalay) in the heart of the Dry Belt.

TOWNS OF BURMA

Rangoon (1951)	.	.	700,000		Mandalay (1941)	.	.	164,000
Moulmein (1941)	.	.	66,000		Bassein (1941)	.	.	46,000

THAILAND (SIAM)

Siam, or Thailand ('Land of the Free') as its government has decreed that it shall be called, is a constitutional monarchy in south-east Asia with an area of 198,000 square miles (more than twice the size of Great Britain) and a rapidly growing population estimated in 1949 at 18m. Occupying the western part of the Indo-Chinese peninsula, it lies to the south-east of Burma, just beyond the River Salween, which partly borders it on the west, while on the north-east and east it has two of the three constituent states of Indo-China within the French Union, namely Laos and Cambodia. Southward it reaches to the head of the Gulf of Siam, and a long south-western arm, which for some distance divides the Malay Peninsula with Burma, afterwards occupies the full width of the peninsula as far as the borders of British Malaya and looks out not only on the Gulf of Siam to the east, but on the Indian Ocean to the west. This long southern extension is for the most part a mass of jungle-clad hills covering in all some 30,000 square miles—an area equal to that of Scotland.

The main body of the country, from Burma down to the Gulf of Siam, falls into two divisions, western and eastern—respectively the basin of the Menam, which lies wholly in Siam, and part of the basin of the Mekong, whose middle course is Siam's eastern boundary. The basin of the Menam in turn falls into two main areas. In the north is a wide expanse of mountainous forested land bordering on Burma and the Laos country, and a strip of similar land runs along the western frontier. Emerging from the wooded hills of the north, the Menam and its many affluents form a vast alluvial plain of great fertility, subject to annual inundation, and the mainstay of Siam's economic wealth. A belt of hill country along its eastern edge forms a watershed between the Menam basin and that of the Mekong, another vast plain for the most part, though broken by stretches of hills, and having more of the character of a low plateau than the alluvial flats of the Menam.

These various regions of Siam are rich in varied resources, but the production of outstanding importance is the rice crop of the lower Menam valley. Altogether rice is grown on over 12m. acres in Siam, and the yield of paddy has increased to between 6m. and

7m. tons, not only supplying home needs but providing about half the value of the exports. No other product approaches rice in commercial value, but it may be noted that after the Second World War the export of rubber jumped up to round about 100,000 tons, and in 1950 constituted one-fifth of the exports in value. Some 600,000 tons of sugar-cane from 60–70,000 acres yield nearly 50,000 tons of raw sugar, and other crops include ground-nuts, cotton, and tobacco. The most numerous livestock are buffaloes (5½m.) and cattle (5m.), both of which are used as draught animals.

Nearly two-thirds of Siam is covered with forests and woodlands. Their area is returned as 125,000 square miles, and the mountainous north especially is rich in valuable timbers, notably teak, for which Siam is famous. Logs are floated down the rivers, chiefly those of the Menam basin flowing to Bangkok, but also down affluents of the Salween into Burma, and down the Mekong into French Indo-China. In 1950, exports of forest products were valued, at the official rate of exchange (35 ticals or bahts to the £) at about £5m., of which teak provided over half. The timber trade is largely in the hands of British companies.

Mineral resources are numerous and widespread, but hitherto their development has been chiefly confined to tin, wolfram, and precious stones (rubies and sapphires). The tin mines, mostly under British ownership, are the biggest factor in the mineral industry, the output for export in 1950 being valued at about £8.5m. The total value of all classes of exports in that year was about £100m., of which, as already noted, rice represented nearly half and rubber one-fifth. Imports—chiefly textiles, iron and steel goods, machinery, petroleum products, and foodstuffs—amounted to about £80m.

Siam is comparatively well off for railways. They are state owned, and Bangkok, the capital, situated in the Menam delta, is the hub of the system. One line runs south through the Malay Peninsula and links up with the railways of the Federation of Malaya, placing Bangkok in direct railway communication with Singapore. Other lines reach out in many directions—north-west, north, north-east, east—towards the frontiers of Burma, Laos, and Cambodia; and through Cambodia there is connection with Saigon, in southern Viet-Nam. Altogether the Siamese state railways extend to over 2,000 miles. There are over 4,000 miles of roads, mostly ranking as second class. The rivers are not generally navigable, and even Bangkok, which is not only the capital but the chief port, 25 miles up the Menam from the sea, is not accessible to vessels drawing more than about 14 feet.

Bangkok, sometimes called the Venice of the East, accommodates over a million people, and is the only really large city in Siam.

INDO-CHINA

Before the Second World War, Indo-China was part of France's colonial empire, comprising the colony of Cochin-China in the extreme south of the Indo-Chinese Peninsula; the protectorates of Annam and Tongking along the east coast, facing the South China Sea; the protectorate of Cambodia, in the south-west, adjoining southern Siam and fronting the Gulf of Siam; and the Laos protectorate, an inland territory bordering eastern Siam. As a result of the war these five territories have been reconstituted as three independent states associated with France in the French Union. Cambodia and Laos have become sovereign states with constitutional monarchies. Cochin-China, Annam, and Tongking are combined in the republic of Viet-Nam and are known respectively as South, Central, and North Viet-Nam; the former Emperor of Annam is recognised as 'Chief of the State.'

National budgets have replaced a common budget for the Associated States, which, however, maintain a Customs Union and a common Defence Force. Association with France is continued through a French High Commissioner and Commander-in-Chief, who is represented by a Commissioner in each State. French influence is still considerable, especially as French troops, fighting along with the National Army, are involved in a long and costly war to hold back Viet-Minh (communist) forces, which claim to exercise government in Indo-China and seek to enforce the claim both by Fifth Column activities and by large-scale warfare based on southern China. Thus the country is under continual threat of disturbance, and much of it in the north (Tongking), over against China, has been repeatedly overrun by opposing armies.

The total area is around 287,000 square miles (a third larger than France) and the total population about 28m. Viet-Nam (127,000 square miles) is the largest of the three States, and though smaller than the other two combined, supports over four-fifths of the total population, having nearly 23m. inhabitants. Cambodia (70,000 square miles) has under 4m. people, and Laos (90,000 square miles) is still more sparsely populated, having only about 1½m. Much of the country is mountainous and forest-clad, with peaks rising in the north to some 10,000 feet; only two considerable

areas of low-lying plains are found, one in the north and one in the south. The former, containing the Red River delta, is the smaller and is very densely populated. The southern area embraces the lower valley of the Mekong. More than half of Indo-China is classed as waste or built-on, and more than another 40 per cent. as forest and woodland (120,000 square miles). Arable land may be estimated at 20–25,000 square miles—perhaps 15m. acres. It is doubtful if that area is now under cultivation. Mention has been made of the disturbed condition of the country, and returns of the crop areas in 1948 and 1949 were in practically every case much below the corresponding figures before the war.

As in Siam, the rice (paddy) crop far exceeds all others. The pre-war average was nearly 14m. acres yielding 6½m. tons; in 1949 the estimate was 11m. acres yielding rather more than 4½m. tons. Comparatively little is exported, especially since the war, but in good years rice is the most valuable export. Maize is an important crop, but only pre-war returns are available; they showed nearly 1m. acres under crop, yielding over half a million tons, most of which was exported. Exports since the war have been only a small fraction of this quantity, suggesting that maize has shared in the general decline of production. Typical of the position in other respects is that relating to sugar. Before the war, the average returns approached 100,000 acres producing a million tons of sugar-cane yielding 50,000 tons of raw sugar. In 1948 the acreage was 20,000, the production of cane 200,000 tons, and the yield of raw sugar nearly 20,000 tons. Exceptionally, in the case of rubber, which is a plantation crop and vies with rice as the most valuable export, production has increased from some 40,000 to 50,000 tons. Among other agricultural products are sweet potatoes and yams, cassava, tobacco, ground-nuts, cotton, sesame, tea, and coffee.

Livestock returns in 1948–49 were far below the pre-war figures, the largest numbers being those of pigs (2¼m.; about half the pre-war average), cattle (1·7m., as against 2m. pre-war), and buffaloes (1·3m., a decline of half a million). As in Siam, oxen and buffaloes are largely used as draught animals. Horses, sheep, and goats are relatively few—all told only about 60,000 in 1948–49.

Fisheries are important, both as an industry and as a factor in the food of the people. The chief fishing grounds are at the northern end of the east coast, in the Red River delta, and at the southern end of the peninsula, both in the Mekong delta and especially inland in the waters of Cambodia's Tonle Sap ('Great Lake'), an immense backwater which drains in the dry season to the delta, and in the rains serves as a reservoir for the flood waters of the Mekong, which cannot escape by the delta and are forced back into Tonle Sap. Though only 3 feet to 6 feet deep in the dry season, Tonle Sap is comparable in extent with the Lake of Geneva (over 200 square

miles), and in the rainy season expands to three times that size, with a depth of 25 feet to 50 feet.

A certain amount of timber is extracted from the forests, especially in the northern mountains, the logs being made into rafts and floated down the rivers. Minerals include coal, tin, zinc, and iron ore, all of which are worked; but development is still on a small scale. A railway runs along the whole of the east coast, and branches out in the south from Saigon, in the north from Hanoi. Saigon, on the river of that name, 45 miles from the sea, is the chief port and the seat of the central government. It has canal connections with the Mekong and is the centre of a thickly populated district. Saigon and the neighbouring Cholon shelter over a quarter of a million people, and the Saigon-Cholon conurbation is credited with over a million inhabitants. Phnom-Penh, the capital of Cambodia, at the junction of the Mekong with the arm connecting with Tonle Sap, has another quarter of a million. Haiphong, the chief port in the north, on an arm of the Red River, has a population of about 150,000, and Hanoi, at the head of the Red River delta, formerly the capital of Tongking and now the capital of Viet-Nam, is much the same size.

CEYLON

Ceylon ceased to be a British Crown Colony in February 1948, when it attained independence and became the smallest Dominion in the British Commonwealth of Nations, with the same status as all the other member States. It is a pear-shaped island, broad-based in the south and tapering in the north to where it almost links on with southern India. The greatest length is 270 miles, greatest width 140 miles; with an area of 25,000 square miles and a population of 7m., it is half the size of England and supports one-sixth as many people.

The south has a massive central core, mountainous and jungle-clad, rising to over 8,300 feet at its highest, though the most conspicuous and famous summit, Adam's Peak, revered as a place of pilgrimage throughout Asia, is a thousand feet lower. A comparatively narrow plain fringes the coast in this main southern area. The smaller northern part is flat and sparsely wooded. More than half the island (54 per cent.) is classed as forest country and nearly a quarter as land in agricultural use, the remaining quarter being either waste or unused.

The most populous region is the south-west, which gets the benefit of rain from both the south-west and north-east monsoons. The northern plains are arid and require irrigation. For many

centuries they have been scantily populated, but the remains of gigantic reservoirs and other extensive ruins show that at one time the population was much denser and formed part of a flourishing civilisation. The depopulation is probably the result of malaria and other fevers. Restoration of the old reservoirs began under British rule, many of them are again in working order, and ambitious new irrigation and settlement schemes have been undertaken.

For over four centuries Ceylon has had trading associations with the West. First it was her spices, ivory, and gems that brought merchants to her shores. The expansion of European colonial powers in the search for raw materials brought the country under the control successively of the Portuguese, Dutch, and British. Apart from this admixture, Ceylon is not without its racial problems. The Sinhalese, who are mostly Buddhists, account for about 70 per cent. of the population; indigenous Tamils, living mainly in the north and east, number 12 per cent., and immigrant Tamils from southern India (providing labour for the tea and rubber estates) a further 10 per cent. The balance is made up of Ceylon and Indian Moors, Malays, Burghers (English-speaking people of Dutch and Portuguese descent), and Europeans. These last, though numbering only a few thousands, represent large commercial interests, particularly in the tea gardens and rubber plantations. Only about 15 per cent. of the total population is urban.

Economically Ceylon is largely dependent on her export trade, and it is a weakness of her position that she relies for this trade on three main products—tea, rubber, and coconuts—which provide up to 95 per cent. of the total value. Tea accounts for some 60 per cent.; rubber and coconut products divide about 30 per cent. between them. Ceylon has previously had experience of the dangers of a predominant crop. About the beginning of the nineteenth century, soon after the arrival of the British, coffee was introduced and by the middle of the century it had become the most important commercial crop. A disastrous leaf disease attacked the plants about 1870, and in little more than a decade had wiped out the entire production.

The place of coffee was taken by tea, which has become by far the most important of the island's exports. The tea gardens, occupying the higher elevations up to 6,000 feet, cover 550,000 acres and yield upwards of 300m. lb. of tea annually: a quarter of the world's total production.

Rubber began to play an important part at the beginning of the present century. The plantations cover the slopes of the foothills (below 3,000 feet) and were intensively developed during the Second World War, when, after the fall of Malaya and the Netherlands East Indies to Japan, Ceylon became the principal source of supply available to the Allies. Production in 1950 (115,000 tons) was not

far short of double the pre-war average, and Ceylon competes with Thailand for place as the world's third largest producer; but both are far below Malaya and Indonesia, and Ceylon's output is not a very big factor in world supply—5 to 6 per cent. of the total. The entire production is exported.

More important as a factor in the island's economy are the products of the coconut palm. Not only do these compete with rubber for second place among the exports, in such varied forms as coconut oil, copra, desiccated coconut, coir fibre and yarn, and fresh coconuts, but only half the production is exported; the other half is absorbed by home consumption. The coconut plantations lie in the plains, valleys, and lower hill terraces of the south-west, also in the extreme north around Jaffna, and intermittently along the coast.

Lesser agricultural exports are cocoa, cinnamon and other spices, citronella oil, and areca nuts. Paddy (unhusked rice) is an important crop to which is devoted over a million acres—a larger acreage than that of any other product except coconuts. It grows in all but the higher parts, yields a third of a million tons, and meets one-third of the home need for this staple food.

Livestock are chiefly of importance as an adjunct to agricultural operations. Cattle are the most numerous—over a million; and the number of buffaloes approaches three-quarters of a million. Sheep and goats (mostly goats) number nearly half a million.

The island has many minerals, those of chief commercial importance being gemstones (notably sapphires) and an almost pure graphite (containing more than 99 per cent. of carbon). In the north are large deposits of limestone, now being worked for the manufacture of cement. Kaolin, heavy mineral sands, and quartz are also present. Geologically a detached fragment of the ancient plateau of peninsular India, the occurrence of mineral oil or coal is unlikely.

Manufacturing industries on a considerable scale are mainly restricted to the preparation of agricultural products. Plans for establishing new industries were given an impetus by the Second World War, and there are now state-run factories for the production of coir goods, leather goods, plywood, rolled steel, acetic acid and wood preservatives, ceramics, paper, quinine salts, shark liver oil, glassware, cement, and various handicrafts. These are comparatively small; output in most cases is short of demand and deficiencies are made up from a wide range of imports. New projects initiated by the government include big agricultural, irrigation, and hydro-electric schemes. If the provision of cheap and abundant power becomes a reality, the effect on the industrial development of Ceylon may well be far reaching.

The principal imports are, in order of value: rice, cotton goods,

wheat flour, sugar, liquid fuel, fertilisers, fish products, iron and steel, machinery, and currystuffs. Internal communications, both rail and road, are well developed. The capital and chief sea port is Colombo, which is connected by broad-gauge government-owned railways with the main centres, including the old capital and sacred Buddhist centre of Kandy. Galle, on the south coast, which was a much frequented port of call before the opening of the Suez Canal and before the completion of the fine harbour at Colombo, is now little used. Trincomalee, on the north-east coast, is famous as a naval base with one of the finest natural harbours in the world.

CHIEF CITIES (1946 CENSUS)

Colombo	362,074	Kandy	51,266
Jaffna	62,543	Galle	49,009

MALDIVE ISLANDS

The Maldivé Islands, 400 miles to the south-west of Ceylon, comprise a group of twelve coral atolls forming a republic with representative government. They constitute a British protectorate, formerly ranking as a dependency of Ceylon, but coming directly under British suzerainty since Ceylon acquired dominion status. The twelve atolls include a vast number of islands—the name means ‘Thousand Islands’—but only about 200 are inhabited. They have a sea-faring population (Moslem) of nearly 100,000, grow coconut palms in great profusion, and produce also millet, fruit, and edible nuts.

Note:—After remaining a republic for just over a year, the Maldives reverted to their traditional status as a Sultanate in February, 1954.

MALAY²A

At the southern end of the long Kra Peninsula, which stretches southwards from Burma and Siam nearly to the Equator, lies the Federation of Malaya. It is a British dependency consisting of nine States—from north to south, Perlis, Kedah, Perak, Kelantan, Trengganu, Pahang, Selangor, Negri Sembilan, and Johore—together with the two west coast settlements of Malacca and the island of Penang.

British influence in Malaya began with the acquisition of Penang in 1786 and was gradually extended over the mainland States, chiefly by treaty with the different Malay rulers, the last being with the Sultan of Trengganu in 1919. The present Federation was formed in 1948, by agreement with the State rulers, after the liberation of Malaya from Japanese occupation in the Second World War.

Under the Federation, each Malay ruler governs his own State according to an agreed constitution, subject to the authority of a central government under a High Commissioner. Despite the political change, liberation did not lead to peaceful development. The infiltration of communist bands, practising terrorist activities from jungle haunts, has kept the country in a state of unrest until the present time (1953), notwithstanding the employment of large numbers of troops against the terrorists. There has, indeed, been development since the Japanese were expelled, but it has been in spite of continual outrages and counter-measures of suppression.

The area of the Federation, just on 51,000 square miles, is practically the same as that of England, but it supports only about one-eighth as many people (5½m. in 1950). A complicating factor is the mixed character of the population. The Malays, whose country it is, are actually in a slight minority (2·58m.); there are over 2m. Chinese, who with the Europeans supply most of the business 'drive'; over half a million Indians and Pakistanis, and over 70,000 others, including Europeans. Nearly half the Malay population is contained in the northern States of Kedah, Kelantan, and Trengganu; in the other States and in Penang the Chinese outnumber the Malays. Inter-racial jealousies add to the natural difficulties in the way of development, but there is growing appreciation of the need for a policy of racial co-operation.

The northern and central parts of the Federation, where the peninsula is at its widest, consist for the most part of jungle-clad mountainous country rising in outstanding peaks to over 7,000 feet, broken by the valleys of swift-flowing rivers of which the two longest, the Perak and the Pahang, on opposite sides of the peninsula, have courses of 200 miles or more. Further south, where the peninsula tapers towards Singapore, the mountains peter out and the general level is below 600 feet; but even here are patches of the central mountain chain which traverses the Federation from north to south. By far the greater part of the country is covered with dense tropical jungle or swamps. The official estimate of the forested area is 38,000 square miles—75 per cent. of the whole; and another 3,000 square miles (6 per cent.) is classed as unused but potentially productive. Built-on or waste areas account for 1,300 square miles (2½ per cent.), leaving 16½ per cent. (over 8,000 square miles; more than 5m. acres) of arable land.

Rubber. Commercially the Federation is largely dependent on rubber and tin, which provide roughly four-fifths of the exports by value. Rubber is the outstanding agricultural product. Of the gainfully occupied population of nearly 2m., a third are engaged entirely or mainly in the rubber industry, half of them on the actual plantations, which occupy some 70 per cent.—3½m. acres—of the cultivable area and account for well over half the total value of the

exports. Estates comprise nearly 2m. acres, and the remaining area under rubber is made up of smallholdings, held chiefly by Malays. In spite of difficulties of rehabilitation after the Japanese occupation, Malayan rubber production increased steadily, and with the market price rising steeply, after a temporary period of stagnation, the Federation became the largest dollar-earner among the British dependencies. Before the war production was limited under international regulation; in 1934-38 it averaged rather more than 400,000 tons. After liberation it expanded to nearly 700,000 tons, and until 1950 Malaya was the world's largest producer, but in that year Indonesia produced a few tons more—692,750 against 692,585. In 1951, owing to terrorist activities, labour difficulties, and bad weather, the Malayan yield fell to just over 600,000 tons, while Indonesian production shot up to nearly 800,000 tons.

The yield of Malayan rubber has been much improved in recent years by the introduction of high-yielding budded stock on the estates. While the market price remained high, many smallholders were reluctant to undertake much-needed replanting, but they too have recently begun to introduce improved methods and higher yielding stock. In the early days a yield of about 400 lb. an acre was considered satisfactory; now yields up to 2,000 lb. an acre are obtained. All possible improvements in this and other ways are especially desirable, not only to meet the drop in price which followed the post-war boom, but to compete with the synthetic product, which has become a serious rival, especially in the United States. (See under Commodities: Rubber; p. 218.)

Rice and other crops. Apart from rubber, the main agricultural crop is rice, of which Malaya produces about half of its own requirements. In the immediate pre-war years, the area under paddy cultivation averaged nearly three-quarters of a million acres, with an average yield of half a million tons. After the war, when rice was in very short supply in south-east Asia, the area under cultivation was increased considerably, but production showed little increase—in one year an actual decrease—till 1949: a particularly favourable season, when the area under paddy rose to over 900,000 acres and the yield was about 700,000 tons.

The area under oil palms has also increased steadily in recent years—from a pre-war 76,000 acres to upwards of 93,000 acres in 1950, when production amounted to over 53,000 tons of palm oil and 13,000 tons of kernels. Under proper cultivation, the oil palm gives very high yields in Malaya. Unlike rubber, it has not attracted smallholders, cultivation being almost entirely confined to estates. On the other hand, coconuts are very largely grown by smallholders, and their production of copra (111,000 tons in 1950) is nearly three times that from estates (39,000 tons in 1950). Under the stimulus of high prices, production of both copra and coconut oil has risen

rapidly. Tea is grown, mainly as an estate crop, in both highlands and lowlands. Much of it is sold locally, but exports have increased substantially in the last decade and amounted to 3½m. lb. in 1950. The growing and canning of pineapples has become a considerable industry, and a modest export of 13 tons in 1946 had by 1950 grown to nearly 15,000 tons. Other products include coffee, tobacco, bananas, areca nut, tapioca, and mixed fruits.

Development of the extensive forest resources of Malaya was delayed by the war and has since been hindered by terrorist activities; but nearly one-fourth of all the forested lands have been designated by government as reserved. The production of timber is increasing, and exports have bounded up in recent years. Production from all sources reached over 42·7m. cubic feet in 1951 against 36m. cubic feet in 1950, and 28m. cubic feet in 1949. With prices rising all the time exports were valued in 1950 at Malayan dollars 17½m. (rather more than £2m.), or about twice the value of the 1949 exports, and they further rose in 1951 to M\$18·3m., though in quantity exports fell from 120,000 tons in 1950 to 86,000 tons in 1951.

The Malayan fishing industry is also expanding, with the introduction of modern power-driven craft and more up-to-date methods of fishing and marketing. The Federation has a thousand miles of coast, and landings in 1949 were over 71,000 tons—a third more than in the previous year. The yield is entirely absorbed locally.

Malaya offers little scope to a livestock industry. The whole Federation can muster only about a thousand horses (pre-war as well as post-war number) and sheep are down to about 20,000 (pre-war 35,000). Cattle and pigs and goats are much more numerous; the production of meat is equal to about 100 per cent. of local requirements of fresh pork, 90 per cent. of fresh beef, and 60 per cent. of fresh mutton. The rearing of buffaloes for work in the rice-fields is of major importance and though their numbers declined during the war, they have since more than recovered lost ground and in 1950 were on the way to reaching a quarter of a million. Oxen, already numbering about that figure, are reared for both agricultural and draught purposes, and supply the main demand for fresh beef. Goat mutton is generally preferred locally to imported sheep mutton, and the number of goats, reduced during the war by fully one-half from the pre-war total of 300,000, is well on the way to reaching that total again. The pig industry has also expanded and is expected to continue to do so, as provision for rearing is being made in most of the resettlement areas. Their numbers are difficult to compute, but are estimated at over 300,000.

Minerals. Some of the world's richest deposits of tin ore are found among Malaya's mountain ranges, and normally the Federation is the leading country of production, surpassing the output of both Indonesia and Bolivia, the other chief sources of supply.

During the Japanese occupation, production fell to a very low ebb, but afterwards the industry revived rapidly, and in spite of the difficulties of rehabilitation (particularly renewal of the giant dredgers forming part of the equipment of the big companies), output was practically back to pre-war normal by 1949. In that year production, in terms of metal content of the ore, was some 55,000 tons, representing about one-third of the world total, and in each of the two following years, 1950 and 1951, Malayan production exceeded 57,000 tons. About 60 per cent. of this output comes from European-owned mines and 37 per cent. from Chinese mines. The industry employs nearly 90 per cent. of the total mining labour force in Malaya. The ore is smelted in Butterworth (opposite to Penang), and in Singapore, and the tin exported in the form of ingots, blocks, bars, and slabs. In the immediate post-war years demand exceeded supply and prices soared. Normally the supplies of tin available on the world's markets exceed the demand, and conditions reverted to this state of affairs in 1951, with recession of prices and other difficulties for the tin-mining industry, so newly re-established at such heavy cost. By March 1952, twenty-three Chinese mines had ceased to operate. (See also *Commodities: Tin*; p. 275.)

Other mineral products of Malaya have been slow in recovering from the low ebb to which they fell during the war. Previously, several iron mines were operated by Japanese and the ore shipped to Japan; by 1940 their output had reached nearly 2m. tons. After the liberation little was done to revive the industry till 1950; then the most prosperous of the former Japanese mines, in Trengganu, produced close on half a million tons, and in the following year output jumped to 850,000 tons. In the State of Selangor are the only coal-mines in Malaya. Production has fluctuated considerably since 1940, when it reached nearly 800,000 tons. Both in 1950 and in 1951 it was only about half that quantity. The same is true of gold-mining in Pahang: in the same two years, output was less than half the pre-war production of 40,000 troy ounces. In the case of bauxite, which was mined by Japanese in Johore and Malacca before the war, no new production has since taken place; but investigations have revealed the presence in Johore of over 10m. tons of high-grade and marginal bauxite ore.

Despite its commercial importance, only about 2 per cent.—40,000—of the working population are employed in mining. An overwhelming proportion—60 per cent., nearly 1·2m. persons—are engaged in agricultural industries, including, as already indicated, nearly 300,000 on rubber plantations. Fishing occupies 60,000, transport and communications nearly 70,000, and commerce and finance over 150,000. Manufacturing industry, though not in the forefront of Malaya's economy, is scattered throughout the Federa-

tion in food factories, wood and metal works, &c., and since the Second World War there have been signs of growing interest in the possibilities of industrial development. At Kuala Lumpur, the capital, a company of world-wide reputation has opened a soap and margarine factory, which will give extensive employment and provide a local market for large quantities of Malayan palm oil; and in Selangor a cement manufacturing company has been formed with a projected output of 100,000 tons a year. The capital outlay on each of these enterprises is put at M\$10m. (well over £1m.).

A through railway system connects the Federation with Singapore to the south, and with Thailand to the north. The main line traverses the western coastal belt and sends out short branch lines to the western ports. The so-called East Coast Line runs through the centre of the peninsula to the east coast at Tumpat, on the Siamese border of Kelantan. Much of it was dismantled by the Japanese, and owing to terrorist activities a gap of 100 miles still awaited reconstruction in 1952. The total route mileage open to traffic is about 900 miles. Roads extend to 6,000 miles, and for two-thirds of that distance the surface is metalled and grouted or sealed with bitumen. Only 700 miles of roads have a plain earth surface.

Analysis of the overseas trade, especially its distribution, is complicated by the present administrative separation of the Federation of Malaya from the adjoining Colony of Singapore; by the large amount of the trade of neighbouring countries which passes through the Federation and/or Colony; and by differences in the Customs' practice of apportioning the latter trade. Nearly half the Federation's imports, coming from a world-wide range of countries, are consigned to it from Singapore; and nearly half the exports, which find their way to countries all over the world, are consigned in the first instance to Singapore. The products of Indonesia and Thailand are largely shipped through Singapore and Penang, and it is pointed out in the annual report on the Federation for 1950, as an example of the difficulties of a complete analysis of the trade returns, that 'imports of rubber from Thailand on a through bill of lading are not included in the Penang import and export trade figures, though if they were to arrive from that country overland for re-export through Penang they would be included.' In the *International Trade Statistics* published by the United Nations, the trade of Singapore and Malaya is recorded in combined tables, covering both territories. (See under Singapore.) In the case of Malaya, the volume of trade in its chief commodities has already been indicated, and to give an idea of its financial magnitude it may suffice to note that in 1950 exports were valued at M\$2,610m. (£304m.). In the same year imports were valued at M\$1,177m. (£137m.).

Penang, off the north-west coast, is the chief port. Declared a

free port in 1946, it is a busy *entrepôt* and processing centre, doing an active trade with near-by countries. In the centre of the west coast, Port Swettenham, at the mouth of the River Klang, is the port for the Federal capital, Kuala Lumpur, which lies on the same river about fifty miles inland. Since the war, this port has grown markedly in importance, and it has been necessary to extend the facilities for shipping. On the other hand Malacca, farther south, has declined in importance as a main port, though it still handles a good deal of coastal trade. There is no considerable port on the east coast.

TOWNS IN THE FEDERATION OF MALAYA
WITH A POPULATION OF MORE THAN 30,000 (1947 CENSUS)

George Town (Penang)	189,068	Johore Bahru (Johore)	38,826
Kuala Lumpur (Selangor)	175,961	Seramban (Negri Sembilan)	35,274
Ipoh (Perak)	80,894	Klang (Selangor)	33,506
Malacca (Malacca)	54,507	Alor Star (Kedah)	32,424
Taiping (Perak)	41,361	Bandar Maharuni (Johore)	32,228

SINGAPORE

Though a separate colony, the island of Singapore is an appendix, geographically, to the Federation of Malaya. Lying off the southern end of the Malay Peninsula, it is separated from the mainland by a strait only three-quarters of a mile wide, and this is crossed by a causeway carrying both a road and a railway—the main railway north through the peninsula. The island (220 square miles)—half as large again as the Isle of Wight—supports a population of over a million, of whom nearly four-fifths are Chinese and only one-eighth Malays. If Singapore were amalgamated with the Malay Federation, Chinese would have a majority over Malays in the total population, which, in view of racial feeling, is one of the reasons for keeping the two administrations separate.

Nearly three-fourths of the island population is gathered within the city and port of Singapore, which lies on the south coast and covers, within the limits of the municipality, some 32 square miles—one-seventh of the whole island. The island is low-lying (under 600 feet at its highest point), with patches of the original jungle but mostly covered with a light growth of secondary forest, plantations of economic crops (rubber, coconuts, pineapples, tobacco, pepper), market gardens, and ever-expanding urban areas. Mangrove swamps fringe the west coast and extend up the inlets; on the eastern side are low cliffs. Industrial activities include tin-smelting, saw-milling, and pineapple canning; but Singapore's fame rests on the double importance, strategic and commercial, of its position as—to quote

an old cliché—'the Clapham Junction of the Orient.' This importance has its focal point in Singapore city, or rather in the commodious harbour round which the city has grown: the busy centre into which pours and from which is distributed much of the trade, both import and export, not only of the Malay Federation but of other near-by countries, notably Indonesia.

In the United Nations *Year Book of International Trade Statistics*, Singapore and the Federation of Malaya are treated as a single unit. The annual value of the imports and exports of this unit, before and after the Second World War, illustrates the change of values in the interval. The Malayan dollar (M\$) is linked with sterling, and except during the Japanese occupation has always had the fixed sterling value of 2s. 4d. (roughly 8½ to the £). In 1938, imports were M\$548m. (£64m.); in 1949 they were valued at M\$1,840m. (£215m.). Exports in 1938 were M\$571m. (£67m.); in 1949 they were valued at M\$1,678m. (£196m.).

Foodstuffs and non-dutiable beverages made up nearly a third (M\$602m.) of the imports in 1949, with rice (M\$205m.) as the biggest item; and nearly another third, in amounts roughly equal in value to that of rice, was made up by (1) textiles (mostly cotton piece goods), (2) motor and aviation spirit, kerosene, diesel, fuel, gas, and lubricating oils, (3) rubber and copra.

Among exports in 1949, rubber in its various forms, nearly all dry sheet and crepe, easily topped the list in value, providing 43 per cent. of the total, followed by tin with 16 per cent., while copra, coconut oil, and palm oil came third with 8 per cent. In contrast with the imports, exports of foodstuffs amounted to only 8 per cent. of the total, with pepper as the biggest item; motor and aviation spirit, kerosene, diesel, and other oils, accounted for over 7 per cent., and textiles (mainly cotton piece goods) for nearly 5 per cent. Other items or groups were all comparatively small; it will be seen that those enumerated amounted to nearly 90 per cent. of the whole.

Nearly half the imports in 1949 were provided by the United Kingdom, Indonesia, and Thailand, in that order of the magnitude of their supplies. Half the exports were taken by the United States, the United Kingdom, Indonesia, and Australia, the first two being much the most important buyers, accounting for well over a third of the total. In later years, trade values were very much higher. In 1951 the boom in rubber and tin sent exports up to over M\$6,000m., and in 1952 they were still nearly M\$4,000m. But analysis shows very little difference in the character of the trade.

Christmas Island. A dependency of the colony of Singapore, situated about 220 miles south of the western end of Java. It covers some 60 square miles (less than half the size of the Isle of Wight) and has under a thousand inhabitants, but rises to a plateau

over 1,000 feet above the sea, rich in deposits of phosphate of lime, which are worked in association with the British Phosphates Commission.

Cocos and Keeling Islands. A group of small coral islands (total area $1\frac{1}{2}$ square miles; population under 2,000) in the middle of the Indian Ocean. Long incorporated in the colony of Singapore, the group was transferred to the Commonwealth of Australia in 1952 for use as a half-way house on the air route between Australia and South Africa. Groves of coconut palm yield nuts, oil, and copra for export.

BRITISH BORNEO

Though Indonesia has the major part of the great island of Borneo—the third largest island in the world, excluding the continents—the British Empire includes the north and north-western parts, forming between a fourth and a third of the whole. This British sphere comprises (1) the Colony of North Borneo; (2) the Colony of Sarawak; and (3) the protected State of Brunei, lying between the other two.

NORTH BORNEO. Administered by the British North Borneo Chartered Company from 1882 to 1946, when it was taken over as a colony, North Borneo has an area of close on 30,000 square miles (roughly equal to that of Scotland) and a population estimated in 1950 at about 350,000 (three-fourths the population of Edinburgh). The annual rainfall is from 60 to 100 inches. A mountainous interior, with a famous highest peak, Mount Kinabalu, rising to 13,455 feet, is bordered on the west by a long and fairly narrow coastal plain, containing the main rice and rubber producing areas, and on the east by much more extensive plains, comprising both paddy-growing lands and wide stretches of pastoral country. Dense forests covering most of the hills and valleys are a valuable source of timber supply, and other primary products are chiefly rubber, copra, manila hemp (abaca), tobacco, rice, and sago. Normally, with the exception of rice, these all contribute to the export trade.

Creditable as was the pioneer work of the Chartered Company, the country is still at an early stage of development, and it suffered a severe setback from enemy occupation in the Second World War. The new colonial administration is pursuing an active policy of restoration and experimental progress, and the Colonial Development Corporation is backing projects for rubber and abaca planting and cotton raising. Rubber is the chief crop and covers about 125,000 acres, mostly in small holdings of under 50 acres. It provided nearly half the value of the exports in 1949—Malayan dollars 15·9m. (£1·9m.) out of M\$37·7m. (£4·4m.)—and nearly two-thirds

of their value in 1950—M\$59.9m. (£7m.) out of M\$92m. (£10.7m.). Values in the latter year were inflated by the temporary boom in rubber prices; there was no proportionate increase in the quantity of rubber exported—nearly 20,000 tons in 1949; 24,000 tons in 1950. Imports increased in value from M\$34m. (£4m.) in 1949 to M\$46.1m. (£5.4m.) in 1950.

A metre-gauge railway 116 miles long serves the west coast region, and the colony has about a thousand miles of roads, mostly bridle paths but a quarter of them metalled. The coast line, deeply indented, also extends to nearly a thousand miles—mostly alluvial flats, creeks, and swamps—and the chief towns in the colony are the ports; in 1950 they handled over half a million tons of cargo. Outstanding commercial centres are Jesselton, the new capital, about half-way along the west coast; Victoria, off the south-west coast, on the island of Labuan (formerly one of the Straits Settlements, incorporated in North Borneo when the colony was constituted in 1946); and Sandakan, the former capital, on the east coast bay of that name.

SARAWAK. For over a hundred years after a dashing young Englishman, James Brooke, was invited by the people in 1841 to become their ruler, Sarawak was famed as the Land of the White Rajahs. At the end of the Second World War the third Rajah Brooke ceded the country to the British Crown, and it was proclaimed a colony in 1946, exchanging the paternal rule which the first two Rajahs and their enthusiastic officers had developed so successfully and proudly, for the modernist outlook of the Colonial Office.

Stretching south-west from North Borneo, Sarawak is much the bigger country (47,000 square miles; nearly as large as England), and has a larger population, though still very small for its size (over half a million). Instead of a mountainous central region, it has a wide rampart of mountains, with peaks rising to 6–8,000 feet, bordering its inland frontier—part of the backbone of Borneo as a whole. The mountains drop to an extensive belt of lowlands, reaching to the sea and mostly covered, like the mountains themselves, with dense jungle and forest, which are estimated to occupy something like 80 per cent. of the surface. With an annual rainfall of 100–200 inches, the country is traversed by wide rivers, some of which are navigable for considerable distances and provide locations for some of the chief towns, well away from the coast. Kuching, the capital, a town of 38,000 inhabitants in the south-west, lies about 25 miles up the Sarawak river, and Sibü (population 10,000), more centrally situated and well known as a river port, is about 60 miles up the Rejang.

Agriculture is the chief industry, and is practised mainly on a subsistence basis, but sago, rice, and pepper are also commercial crops, and in this last category rubber is supreme. A useful oil-

field has been opened up in the neighbourhood of Miri, near the northern end of the coast. Both town and oil-field were badly damaged in the Second World War, but have been opened up again, and Miri is credited with a population of 9,000. Under new ownership, animated by new ideas of progress, the whole country is in a state of transition, and it may take some time for new lines of development to crystallise. In 1949, exports were valued at M\$188m. (£22m.) and imports at M\$110m. (£13m.).

BRUNEI. Comprising a couple of enclaves at the north end of Sarawak, the Brunei Protectorate has an area, all told, of under 2,250 square miles (rather larger than Lancashire) and a population of under 50,000; but within this area is one of the most prolific oil-fields in the British Empire. It is linked on to the Sarawak oil-field, and has developed around Seria, now (1953) a town of some 11,000 people, newly built, for the most part, since the war. The crude oil is shipped in vessels of the oil-company's fleet from the port of Kuala-Belait, a town of about 5,000 people. Over 96 per cent. of the value of Brunei's exports is provided by these exports of crude oil, which amounted in 1949 to 3.2m. tons (24m. barrels) valued at M\$60m. (£7m.), and in 1950 to 4m. tons (30m. barrels), valued at M\$198m. (£23m.). The only other considerable export from Brunei is plantation rubber. Brunei town, the capital, mostly built on piles in a broad sweep of the Brunei river, has about 11,000 inhabitants.

INDONESIA

The islands of the Malaya Archipelago which, before the Second World War, comprised the Netherlands East Indies now constitute the Republic of Indonesia, a sovereign independent State co-operating with the Netherlands on a voluntary basis under a statute of union which recognises the Netherlands Crown as the common head. The republic includes all the island territories formerly belonging to the Netherlands with the exception of Western New Guinea, whose status is still (1953) the subject of negotiation. Apart from this territory, the republic has an area of nearly 600,000 square miles with a population of some 75m.

Among the multiplicity of islands are four which contribute nearly half a million square miles, or five-sixths of the total area. These are the Great Sunda Islands: Borneo (Indonesia's share, 208,000 square miles; almost as large as France), Sumatra (164,000 square miles), Celebes (73,000 square miles), and Java (51,000 square miles; practically the same size as England). The remainder of the republic is made up of islands off the east coast of Sumatra

(the Rioux-Lingga archipelago, Bangka, and Billiton), the Lesser Sunda Islands (stretching east of Java towards Australia, including Bali, Lombok, Soembawa, Soemba, Flores, and Timor—half of this last being Portuguese); and the Moluccas (the original Spice Islands, between Celebes and New Guinea).

By far the most important, economically and politically, is the smallest of the four main islands—Java. Though no larger than England, it has an even denser population, numbering some 50m., or about two-thirds of the population of all the islands. It contains the capital and seat of government—long famous under the Dutch as Batavia, now renamed Djakarta—and it is easily the biggest factor in production and trade. Long and narrow, traversed by a volcanic chain with peaks up to 12,000 feet, some of which are still active, it has rich volcanic and alluvial soils, combined with facilities for irrigation, which, together with the equatorial climate, make it unsurpassed as a forcing-house for the most valuable tropical products. Like other tropical countries, it is peculiarly subject to fluctuations and changes if disease should sweep through the crops or if standards of efficiency be allowed to deteriorate. At one time coffee was the staple product; it was displaced by sugar, which in turn has declined, and rubber has come to the fore. Tea, sisal, tapioca, cinchona, and tobacco are other favoured crops; and large areas are sown to rice.

Though not to be compared with Java in their development, many of the other islands have valuable resources. Sumatra, with a backbone of volcanic mountains running down its western side, has on the east a great plain 600 miles long and from 60 to 110 miles wide. This plain is low-lying, marshy near the coast, and liable to flooding in the rainy season from the rivers that wander through it; but in the north-east, where the island narrows and the highlands come near to the coast, which is traversed by a railway, the conditions are more favourable to plantation crops, and various estates have been established, largely under rubber, in the neighbourhood of Medan. Sumatra has considerable mineral resources. Coal is worked among the mountains at the back of Padang, on the west coast, and are served by a railway. Oil-fields have been opened up in the south, around Palembang, and the island is the chief though not the only source of oil supply in the republic, which produces several million tons a year. Tin is also mined, both in Sumatra and in the outlying islands of Bangka, Billiton, and the Riouw archipelago.

Borneo has oil-fields and refineries around Bandjermasin and Balikpapan, in the south-east of the island, but in the main it is a richly wooded, little developed country, with a mountain backbone and lateral ranges separated by wide expanses of lowlands. Celebes is still less developed, consisting almost wholly of jungle-clad

volcanic mountain ridges, sprawling over the ocean like a giant scorpion, with long arms straggling out from a central mass; yet even here copra and spices are grown for export, notably around Manado, at the eastern end of the northernmost arm; and Macassar, in the south-west corner of the island, has made a double contribution to the English language; for not only has Macassar oil become a household word as a hair-dressing but the need of some protection for upholstered backs of chairs and sofas after its use led to the introduction of antimacassars.

Some of the smaller islands are of distinctive commercial interest. The Spice Islands have lost much of their medieval glamour and renown, but they still provide, normally, a considerable part of the world's supplies of the products which gave them their name—pepper, cloves, nutmegs, &c. Another example of this specialised commercial interest is found in one of the Lesser Sunda Islands, Soemba, otherwise known as Sandalwood Island.

Livestock are fairly numerous, if not only the size of the republic but its character be considered. The available returns, relating to the islands as a whole, register a loss of a million cattle in the decade 1939–49, the number in the last year of the period being 3·6m. Buffaloes also declined, from 3¼m. to 2¼m.; but sheep and goats (mostly goats) increased by over 100 per cent. to upwards of 9m.; and pigs, numbered at nearly 1¼m., also showed a slight increase.

Such, then, briefly, are some of the natural factors governing the commercial development of Indonesia. In recent years they have been complicated by other factors which cannot be ignored in any survey of conditions and prospects. Before the Second World War, when the country was under Dutch control, a large number of estate companies carried on a highly successful plantation industry. There was also a large production, especially of food crops, from native holdings; but the commercial crops from the estates—rubber, tea, sugar, copra, tobacco, &c.—were the backbone of the export trade.

During the war the islands were occupied by the Japanese, and the owners of estates were deprived of their properties. In the Spice Islands the pepper vines, which provided a large part of the world supply of black and white pepper, were nearly all destroyed, resulting in a world shortage of which the effects were felt on the opposite side of the globe. An autonomous Indonesian administration was set up, and, after the Japanese surrender, proclaimed its independence. This was contested by the Netherlands, and there was a further period of unsettlement, attended by fighting, which delayed the rehabilitation of the estates. It was the end of 1949 before the republic was accorded rights of sovereignty and entered into voluntary union with the Netherlands. Indonesia had been organised on the federal system, but in 1950 it was made a unitary State, a change

which was not accomplished without further disturbance. In the same year it was admitted to membership of the United Nations.

When the estate companies re-entered into possession of their properties, not only had the plantations suffered from neglect and damage, but the conditions of law and order were at a very low ebb. Company reports are full of complaints, not only of excessive taxation and the complicated system of foreign exchange which has been introduced, but of inability to recover some of their properties in disturbed areas, lack of protection against robber bands, prohibitive demands from estate labourers, and wholesale pilfering of crops when land has at last been brought under cultivation again. Numbers of estates in both Java and Sumatra are reported to have been closed down because they cannot longer be conducted on an economic basis. This is the situation at its gloomiest. It is attributed rather to the inability than to the unwillingness of the central government to assist the companies, and the future of the plantation industry would seem to rest with the restoration of law and order.

People will not starve unnecessarily, and in a country so fertile and so densely populated as Java, production from native holdings would be large even if there were no plantation crops. Post-war trade returns show a big increase in nominal value. The unit of currency, the rupiah, is the old Dutch florin, or guilder (about 10·65 to the £). In 1949, imports were valued at rupiahs 1,574m. (more than three times their value in 1938) and exports at rupiahs 1,478m. (more than double their value in 1938). But post-war values are a deceptive basis for comparison with pre-war conditions. Out of thirty-six principal imports in 1949,¹ more than half were less in quantity than in 1938. Even more significant, out of eighteen principal exports in 1949, only three were more in quantity than in 1938, and the decline in the other fifteen was in nearly every case very large. Sugar dropped from 1,196,500 metric tons to 47,000 tons; tea from 82,000 tons to 24,000 tons; coffee from 70,000 tons to 5,000 tons; copra from 566,000 tons to 316,000 tons; palm oil from 221,000 tons to 102,000 tons; tobacco from 50,000 tons to 8,000 tons. The three exports which were more in quantity in 1949 than in 1938 were rubber (410,000 tons against 331,000 tons), tin ore and slag (43,000 tons against 27,000 tons), and fuel oil (2,418,000 tons against 1,744,000 tons). Since then, rubber has gone still further ahead, and in 1951 Indonesia headed the estimates of world production with 791,000 tons, taking the lead from Malaya. The exports of rubber are largely marketed through Singapore. Given law and order, and reasonable conditions for re-establishing the plantation industry, the republic may well emulate its predecessor's success in developing the natural resources of the islands.

Djakarta (Batavia), the capital, on the north coast of Java, has

¹ The United Nations *Yearbook of International Trade Statistics*, 1950.

a population of over a quarter of a million. Its modern port, Tandjong Priok, is about ten miles away. Other important towns in Java include the ports of Surabaya and Samarang on the north coast, and the inland cities of Bandoeng and Surakarta. In Sumatra the chief towns are the river port of Palembang, in the south-east; Medan, in the north-east; and Padang on the west coast. Borneo's largest urban centres are the ports of Bandjermasin and Balikpapan in the south-east, and Pontianak in the west. In Celebes the principal town is Macassar. In the absence of any census since 1930, and uncertainty as to the areas included in urban centres, estimates of town populations are of doubtful value; but the Javanese towns mentioned above, and also Palembang and Macassar, are all credited with populations of over 100,000, ranging up to 600,000.

PORTUGUESE TIMOR. Timor, an island at the south-eastern extremity of the Malay archipelago, falls within the geographical range of Indonesia; but neither the Portuguese, who started its European occupation, nor the Dutch, who came after them, succeeded in ousting the other, and the island was divided between them till the Dutch handed over their part of it to Indonesia in 1949, leaving the Portuguese still in possession of the rest.

Timor is a long narrow island with a longitudinal axis of some 300 miles, lying north-east to south-west, and an area about half as large again as Wales. Portugal has the north-east part of the island, and, by a curious arrangement, an enclave on the north-west coast of the Indonesian section; altogether, some 7,300 square miles (rather less than Wales) supporting a population of under half a million. Dilly, the capital and chief port, on the north-west coast, has some 7,000 inhabitants.

The physical characteristics of Portuguese Timor are those of the whole island, which is traversed by a volcanic range—quiescent now except for a few mud geysers—with peaks up to nearly 10,000 feet. An interesting feature is a series of raised coral beaches at an elevation of 4–5,000 feet. Monsoon forest covers most of the country, though there are stretches of savanna suitable for livestock. The arable land is not highly cultivated. Exports include sandal wood, coffee, copra, and wax. For currency see under **Macao**.

THE PHILIPPINES

The Philippine Islands, forming the northern extension of the Malay archipelago, were ruled by Spain for over 300 years after their conquest in the sixteenth century; ceded to the United States for \$20m. in 1898, after the Spanish-American War of that year; granted provisional independence in 1935; occupied by Japan during

the Second World War; and accorded by the United States full independence as a republic in 1946, with reciprocal trade privileges; followed in 1947 by the lease to the United States of numerous defence bases in the Philippines.

The islands range over nearly 1,200 miles of ocean, between Formosa in the north and Borneo and Celebes in the south, and extend some 750 miles from east to west. Upwards of 7,000 islands have been charted within these limits, but under 500 exceed a square mile in extent, and eleven of these account for over nine-tenths of the total area of 115,000 square miles, while two of the eleven comprise two-thirds of the total. The largest, Luzon, at the northern end of the group, has an area of 40,420 square miles (equal to that of England without the four northern counties—Northumberland, Cumberland, Durham, and Yorkshire), and the second largest, Mindanao, at the southern end of the group, an area of 36,540 square miles (equal to the same slice of England with the further deduction of Lancashire and the greater part of Lincolnshire). The other nine main islands—namely, in descending order of size, Samar, Negros, Palawan, Panay, Mindoro, Leyte, Cebu, Bohol, and Masbate—are all very much smaller, ranging from 5,050 square miles (five-sixths of Yorkshire) in the case of Samar, to 1,260 square miles (nearly the size of Cornwall) in the case of Masbate. The total population of the whole group is about 20m., nearly half of them in Luzon, which includes Manila, the capital and seat of government, with a population of over a million. Luzon is not only the largest but much the most important island in the group, whereas Mindanao, the second largest, is the wildest and least developed, and in general is thinly populated, though it has two large ports, Davao and Zamboango.

The islands are mountainous, rising in Mindanao to a greatest height of 9,500 feet, and are subject to volcanic eruptions. Except in favoured areas the soil is not highly productive, but it is officially estimated for the United Nations that only about 8,500 square miles (between 7 and 8 per cent. of the whole) is built-on or waste. A rather larger area (10,500 square miles) is described as unused but potentially productive. Over half the total (61,300 square miles) is under forests, and over a quarter (31,600 square miles) is classed as arable. Only the relatively small area of 3,700 square miles counts as permanent pastures, and the pastoral industry is inconsiderable, the number of sheep being especially small (28,000 in 1948–49). The numbers of livestock generally declined heavily during the Japanese occupation, and in only two classes did the number exceed a million in 1948–49—buffaloes (1·9m.) and pigs (3·35m.).

There is a considerable trade in lumber and timber from the predominant forest lands, both for home use and for export, the value of the exports in 1949 being over U.S.\$3½m. A wide range of

forest products—gums and resins, vegetable oils, dye woods and barks, &c.—is also a useful source of minor industries. But agriculture is the mainstay of the archipelago's economy. Crops fall into two main classes: subsistence and commercial. The chief food crops are rice (grown in 1949 on over 5m. acres and yielding over 2½m. tons of paddy), maize (grown on over 2½m. acres and yielding 665,000 tons), sweet potatoes and cassava (each yielding some 300,000 tons), and bananas (grown on over a quarter of a million acres and yielding over half a million tons). Despite these and other subsistence crops, the islands are not self-supporting in food, no small part of the home production consisting of plantation crops grown for export. Three of the commercial products are of outstanding importance—copra, sugar, and abaca (manila hemp). In 1938 they provided more than 75 per cent. of the total value of the exports other than gold, and since the war their share of the total has been larger still—96 per cent. in 1947, and even two years later 85 per cent., though in 1950 it dropped to 70 per cent.

Before the war, sugar was the biggest contributor to these commercial crops, with 8m. tons of cane yielding a million tons of raw sugar, and an export of 800,000 tons of centrifugal plus 29,000 tons of molasses, providing 40 per cent. of the total value of the exports other than gold. There was a big drop in production of cane during the war, and recovery was only partial up to and including 1949, when the exports of centrifugal sugar were only half the 800,000 tons exported in 1938; and though molasses increased to 50,000 tons, the combined value dropped to under 20 per cent. of the total.

Abaca is another crop which suffered from the war and its aftermath. Known commercially as manila hemp, it is one of the 'hard' or 'leaf' fibres obtained from the tissue of the leaves and leaf-bases, as contrasted with the 'soft' or 'bast' fibres derived from the bast tissues of the stem. The latter are the true hemp, and are largely grown in Europe and the Farthest East. 'Soft' fibres also include Sunn or Indian hemp, produced only in India. The 'hard' fibres classed in trade circles as hemp include not only manila hemp (abaca) but sisal (known in Mexico as henequen) and the New Zealand phormium. Before the war, the Philippines produced and exported a larger quantity of fibres recognised by the trade as 'hemp' than any other country. The crop averaged about 170,000 tons, nearly all of which was exported. During the Japanese occupation it fell to a very low ebb, and as in the case of sugar, recovery was afterwards slow. In the four years 1947–50 the production of manila hemp in the Philippines averaged only about half the pre-war figure, and fell to fourth place (86,000 tons) in the list of world suppliers of hemp fibres, being exceeded by Tanganyika's production of sisal (averaging 118,000 tons), Mexico's

production of henequen (averaging 108,000 tons), and the U.S.S.R. production of true hemp (rising steadily in the four years and averaging over 90,000 tons). In the post-war export trade in hemp fibres, the Philippines make a better showing, for the U.S.S.R. does not figure in the list of exporting countries and Mexico retains from 50 to 70 per cent. of her production, so that the Philippines, with an average export of 81,000 tons in the four years 1947-50, ranked second to Tanganyika (116,000 tons). On the basis of value, the exports of manila hemp from the Philippines in 1950 provided about 12 per cent. of the archipelago's total exports, exclusive of gold.

It is, however, in respect of copra and other products of the coconut palm that the Philippines play their biggest part in world trade. They not only competed before the war with Indonesia (then the Netherlands East Indies) for the lead over all other countries exporting such products, but since the war their lead has been unchallenged. Before the war, Indonesia exported much more copra than the Philippines but much less coconut oil. The combined products in terms of oil (taking the average oil content of copra as 63 per cent.) gave Indonesia the bigger total in 1937, but the Philippines gained the lead in 1938 with exports equivalent to 376,000 tons of oil against Indonesia's 370,000 tons. The third and fourth countries in the list, Malaya and Ceylon, came far below, with less than half the foregoing quantities. Some of the groves of coconut palms in the Philippines at the outbreak of war were not in full bearing, and with their growing maturity after the war the production of copra, so far from having to be built up again by slow degrees, almost at once took on a big increase. The coconut oil industry fell to a low ebb and recovered slowly, being still far below normal in 1949; but already in 1946 the exports of copra were 600,000 tons (nearly double the pre-war figure) and in the following year they approached a million tons. They dropped again in 1948 and 1949 but were still much higher than in 1938 and much higher than Indonesia's post-war exports. Relatively small but actually large subsidiary exports in this class of products, in addition to coconut oil, are desiccated coconut and copra meal or cake. Altogether, in terms of value, the exports of coconut products were 26 per cent. of the total exports (exclusive of gold) in 1938, 81 per cent. in 1947, 70 per cent. in 1948, and 53 per cent. in 1949.

As already noted, the three main groups of commercial commodities—coconut products, sugar and molasses, and manila hemp—account for over three-fourths of the value of all exports other than gold. The balance is made up chiefly of tinned pineapples, lumber and timber, embroideries, chromite, and metal scrap. Mineral resources are numerous but not highly developed, and the war led to a big decline in output. Gold is found in most of the islands but is chiefly mined in north Luzon. The exports are not recorded, but

the gross output in 1948 was little more than 200,000 fine ounces, or only one-fifth of the production before the Japanese occupation. Copper-mining is also pursued on a small scale in north Luzon, and at Zambales, in the same region, are vast chromite reserves, said to be the largest in the world. Most of the islands have their specialised crops or mineral products. Luzon is of outstanding importance. In addition to the minerals already mentioned in connection with the north of the island, the central plain north of Manila Bay is good agricultural country raising large crops of rice and sugar, while coconut groves abound in southern Luzon. Coconuts are also a feature of Leyte, sugar of Negros, abaca of Davao, rice of Panay, maize of Cebu.

Currency is tied to the United States dollar, the Philippine peso (PP.) being equivalent to fifty U.S. cents or half a dollar. A large proportion of the foreign trade is done with the United States. Imports, mainly comprising a wide range of manufactured goods, though including a considerable percentage of foodstuffs, amounted in 1948 to PP.1,136m. (U.S.\$568m.), more than four times as much as in 1938; and of these imports the United States provided over 80 per cent. Conversely the United States took two-thirds of the Philippines' exports in 1948, and nearly three-fourths in 1949. Owing largely to the increased production of copra, and in spite of the drop in other commodities judged by pre-war standards, exports other than gold shot up in value from PP.229m. in 1938 to PP.484m. in 1947 and PP.592m. in 1948. Since then the value of coconut products has been subject to wide fluctuations in value. Economic conditions were not the only forces at work. As already noted, the Philippines became a fully independent republic in 1946. In some ways the results were disappointing. In 1950 a United States Mission, inquiring into the position by invitation of the Philippines Government, criticised severely the way in which conditions had deteriorated in the previous two years, and recommended not only American financial aid but technical co-operation in carrying out a five-year programme of development and reform.

The principal cities and their populations at the 1948 census were:

MANILA (capital: Luzon Island), 1,025,000

Cebu (Cebu Island) .	167,500	Zamboango (Mindanao)	103,000
Davao (Mindanao Is.) .	111,000	Bacolod (Negros Island)	101,000
Iloilo (Panay Island) .	110,000	Legaspi (Luzon Island)	79,000

HONG KONG

This small island (about a fifth the size of the Isle of Wight) off the south coast of China, near the mouth of the Pearl river leading up to Canton, was ceded to the British Crown in 1841. To it was added in 1860 the peninsula of Kowloon (between 3 and 4 square miles) on the mainland opposite, and in 1898 a 99-year lease was obtained of a further 360 square miles of the mainland and neighbouring islands. The New Territories, as the leased areas are called, are mostly wild and rugged, rising to heights of over 3,000 feet. Hong Kong's value lies in the original island and Kowloon, and more particularly in the strait between them, which forms a magnificent harbour. Hong Kong island itself, within its area of some 30 square miles, rises to over 1,800 feet, and boasts a cable tramway up Victoria Peak as well as an electric tramway service at lower levels. The capital city of Victoria extends for several miles along the north shore, facing the mainland, and has all the accessories of a great port. So has Kowloon, opposite, which has developed not only as a shipping centre but industrially. It is the terminus of a standard-gauge (4ft. 8½in.) railway, which, though running through British territory for only 22 miles, is continued through China to Canton and Hankow.

Hong Kong city and port, including Kowloon, is a hive of commercial and industrial activity—one of the great *entrepôts* of world-wide trade. Before the Second World War the population was estimated at about a million; the colony suffered in many ways from the Japanese conquest and occupation, but since its liberation it has become a city of refuge for Chinese from the adjoining territory and the population has been swollen to over 2m. Trade recovered with remarkable rapidity and its value in Hong Kong dollars (HK.\$), with an exchange value of 1s. 3d. (16 to the £), increased by leaps and bounds. In four years, 1947–51, general imports and exports more than trebled in value. As a result of the *entrepôt* nature of the trade, the principal commodities appear on both sides of the account, the export value being sometimes less than the import value because of local consumption, and sometimes more because of additions by local industry. A remarkable example of new post-war industries has been the establishment of a textile

industry which, starting from zero, was supporting in 1952 a dozen mills with nearly a quarter of a million spindles.

Imports in 1951 totalled HK.\$4,870m. (£304m.), exports HK.\$4,333m. (£271m.). The following table shows the principal features of the trade, amounting in the case of both imports and exports to between 80 and 90 per cent. of the total.

HONG KONG: PRINCIPAL IMPORTS AND EXPORTS, 1951

VALUES AND PERCENTAGES

Commodities.	Imports	Exports
	Million Hong Kong Dollars	Million Hong Kong Dollars
Food, drink, and tobacco	1,001 (20%)	557 (13%)
Textiles	874 (18%)	811 (19%)
Clothing and made-up textiles	79 (2%)	288 (7%)
Chemicals and allied products	656 (13%)	676 (16%)
Base metals and manufactures	379 (8%)	450 (10%)
Rubber	354 (7%)	350 (8%)
Machinery, apparatus and vehicles	276 (6%)	235 (5%)
Animal and vegetable fats and waxes	256 (5%)	216 (5%)
Paper	183 (4%)	165 (4%)
Heating, light and power products ¹	157 (3%)	27 (0.6%)
Above commodities	4,215 (86%)	3,775 (87%)

¹ Mainly lubricants, coal, and coke.

China is normally the dominant factor in Hong Kong's trade, as regards both imports and exports. From the turn of the half-century, trade relations with China were subject to growing restrictions, on account of the war in Korea, and though Hong Kong's total trade continued to increase in value in 1951, the increase was due to mounting prices; the volume of the trade in that year was actually less than in 1950, while in 1952 there was a big drop in value also, largely because of the ban on strategic exports to China, but partly because of other adverse trade conditions, including the revival of Japanese competition. Withal, Hong Kong is still easily the leading international trading centre in the Far East.

In 1951, China supplied 18 per cent. of the imports by value, the United Kingdom 12½ per cent., and other countries of the British Commonwealth and Empire (chiefly Malaya) over 20 per cent., so that altogether one-third of the imports came from British sources. The United States and Japan each supplied 8 per cent., and Thailand 3 per cent. Of the exports, China took no less than 37 per cent., the British Commonwealth and Empire 32 per cent. (more than half going to Malaya), Thailand 20 per cent., and the United States 4 per cent.

CHINA

This vast country, with an estimated total area of over 3½m. square miles (larger than the United States, including Alaska) and an estimated population in 1949 of 463m. (one-fifth of the estimated world total), was a loosely knit empire until 1912, when the Manchu dynasty was overthrown and a republic proclaimed. After prolonged internal dissension a Nationalist Government was formed in 1928; becoming involved in war with Japan in 1937, it joined the Allies in the Second World War and shared in the final victory, but fell a victim to its own inefficiency and the rising forces of discontent, headed by the Communist Party, which gained control in 1949 and proclaimed the 'People's Republic of China,' with Peking as capital instead of Nanking. The Nationalist Government took refuge in the island of Formosa, where it survives (1953) by goodwill of the United States.

The Communist Government, supreme on the mainland, was recognised by several countries, including Great Britain but not the United States. It concluded a treaty of friendship and mutual aid with the Soviet Union, but in general pursued an anti-foreign policy, especially towards the Western Powers, including Great Britain, and gradually made impossible Western ownership and management of industrial and trading concerns, the newspaper Press, and missionary activities. Except as it finds entrance and exit through Hong Kong, sea-borne trade has suffered, while inland trade flourishes across the Chinese-Russian frontier. In the United Nations, applications for the recognition of the People's Republic as China's representative have been vetoed, and in 1953 the Nationalist Government was still recognised as officially representing the Chinese people.

This brief excursus into the political and international situation may suffice to indicate the abnormal conditions under which trade and commerce in China are developing. The present chapter, for the most part, is confined to the physical factors governing progress.

China is the only part of the mainland of Asia besides India with a population of high density. It is able to support so dense a population largely because of the seasonal rainfall distribution. Though the winter temperatures are cool even in the south, and in

the north and most parts of the interior rigorous,¹ the rains, occurring, as in monsoon regions generally, during the season of high temperatures, promote an enormous vegetable production. The population is especially dense in much of the eastern plain, which stretches from north of Peking to south of the Yangtse-kiang, and is mostly below 600 feet; north of the Yangtse it contains only two considerable tracts of uplands, rising to 3,000 feet, and though such uplands are much more common south of the Yangtse, and the coast opposite to Formosa is backed by a wide belt of mountainous country, both uplands and mountains are interspersed with much low-lying land. This is especially true in the far south of eastern China, where the province of Kwang-tung, extending behind and on either side of Hong Kong, is largely a deltaic alluvial plain.

West of the great eastern plain, China is for the most part elevated and to a large extent mountainous, but even the elevated regions are in some places capable of supporting a numerous population. A very densely populated region, embracing parts of eastern Szechwan and northern Yunnan, is the so-called Red Basin, which, besides great mineral wealth, has a peculiar red soil of great fertility. Where that soil is found cultivation can be pursued to a great height up the mountains; and the Chinese in eastern Szechwan cultivate the hill-sides wherever the slope is not above 30°, which is about the steepest a man can walk up unaided by his hands. To the west of this area an isolated level plain of somewhat more than 2,000 square miles in extent, formed of the bed of an old lake, has been irrigated from the waters of the Min with the utmost care for upwards of 2,000 years, and is everywhere covered with a verdure which would be monotonous were it not for the variety of shades. Towards the south-east of this plain lies the rich and populous city of Cheng-tu.

The northern half of China is covered, and vast hollows to a great depth are filled, with a peculiar yellow soil known as loess, which is also of remarkable fertility, and rewards cultivation even at great heights. This soil is light and easy to work, but it has one great drawback. Its productiveness, though often very great, is very uncertain. The soil is so porous that water runs through it with great rapidity, and crops are thus liable to suffer from drought unless refreshed with frequent showers or supplied with water by irrigation; and so it happens that a region which, when rain falls with sufficient frequency, yields the most abundant crops, may in other seasons have its crops entirely destroyed, though the rainfall may have been plentiful enough for soils of another kind. Irriga-

¹ The mean January temperature at Canton, on the Tropic of Cancer, is about 55° F.; at Zikawei (Shanghai), in about 31° N., 37° F.; at Peking, in 40° N., 23° F.

tion, therefore, is practised throughout this region wherever the structure of the ground admits of it, and lands that can be irrigated are in some places of ten or twenty times the value of 'dry' fields. Many parts of China are, like certain parts of India, pitted with wells like a sieve, every field having one.

Contrasts between N. and S. China. While the general characteristics of a monsoon climate are found throughout China, there are necessarily considerable differences in a country which, including Manchuria, ranges in latitude from about 18° to beyond 53° N.—a distance of 2,500 miles. Differences in temperature will be taken for granted, but differences in the distribution of rainfall should also be noted. In the north and south the average rainfall shows a decided culmination in the middle of summer and is very slight at the extremes of the year, but in the Yangtse valley the summer rains are more prolonged, and while the average maximum here also is in the middle of the year, there is a second period of heavy rains in September and October.

Many years ago Baron Richthofen noted the somewhat marked contrasts, for the most part directly or indirectly due to climate, on opposite sides of the Tsinling-shan and Funiu-shan—ranges west of the great plain and south of the 35th parallel, forming an easterly continuation of the Tibetan Kunlun Mountains and constituting a main divide. North of this line of water-partings lie the great loess deposits already described, which are the result of climatic influence, inasmuch as they represent accumulations of dust brought from inner Asia by the north-west winds of the exceedingly dry winters. Filling up the hollows, these deposits give a remarkably uniform aspect to the surface features, except locally where the deposits are themselves cut by deep vertical-sided gorges. On the other hand, to the south of the divide, loess is present only in isolated patches; mountains and valleys are fully formed. Loess being unfavourable to tree growth, the mountain slopes in the north are generally bare, whereas in the south they may have luxuriant trees and shrubs as well as innumerable clumps of bamboo, and expansions of the valley bottoms are filled with fertile alluvium densely peopled. The north is the land of wheat, cotton, and pod-fruits, the south that of rice, tea, silk, tung oil,¹ and sugar-cane. In the north are wagon roads, in the south for the most part only narrow footpaths and tracks for pack animals. In the north, mules, horses, asses, and camels are used as beasts of burden, the first two also for draught. In the south, buffaloes work in the fields, but asses and camels are unknown, and apart from the waterways, human portage was the chief means of transport before roads and railways were built.

¹ A drying oil used for varnishing wood, expressed from the seeds of *Aleurites fordii* and *A. montana*.

China's great rivers are at once her blessing and her bane—on the one hand a source of her soil fertility and a means of travel and transport; on the other, an instrument of devastation and death, overwhelming the countryside with floods and shifting channels. Three rivers of outstanding magnitude cross China from east to west. In the north is the Hwang-ho or Yellow river, so called because of the yellow tinge imparted to its waters by the loess which they carry as silt. The 2,500 miles or more of its course from the Tibetan highlands to the China coast range between rapid torrents and sluggish shallows, neither of which are favourable to navigation; and the current is so heavily laden with silt that in its lower reaches the bed of the river, hemmed in by restraining dykes, has risen above the surrounding plain. So liable indeed is the river to flooding on a large scale and following a new course, often with great loss of life, that the Hwang-ho has long been known as 'China's sorrow.' Shorter by half and milder in character is the Si-kiang (1,250 miles), or West river, in south China. Rising in Yunnan it crosses the province of Kwang-si into Kwang-tung, where it unites with other important rivers (notably the Pei-kiang, or North river) and expands into a great delta, at the head of which is the city of Canton, while off the coast lies the island of Hong Kong. Canton, some 80 miles up the Pearl river from Hong Kong, is one of the great ports of China, accessible to ocean-going vessels, of which the larger find anchorage at Whampoa, eight miles downstream. The Si-kiang and the Pei-kiang are navigable by smaller craft for 200 miles or more above Canton.

Neither the Hwang-ho nor the Si-kiang can compare in commercial importance with the third and longest of China's great rivers, the Yangtse-kiang, which flows across central China for 3,200 miles in its passage from the Tibetan plateau to the China Sea near Shanghai. In the summer months (April to October) it is navigable by the largest vessels frequenting the Far East as far as Hankow, 700 miles upstream, and before the Second World War several lines of steamers plied between the two ports, while two British shipping companies maintained a service between Hankow and Europe. In the winter months the depth of water limits navigation to light-draught steamers. Beyond Hankow, steamers drawing up to 15 feet can ascend the river in the season of high water up to Ichang, over 1,000 miles from the sea. Above that point, a succession of rapids makes navigation difficult, but Ichang is at the western edge of the plain and land travel is also difficult in the mountainous country beyond, leading to the fertile and populous Red basin of Szechwan. The need for the exchange of products between the highland provinces and the provinces of the plains is insistent, and despite the difficulties of navigation there is river traffic for another 400 miles above Ichang, maintaining communications and trade with

Chungking, the capital of Szechwan. Specially built flat-bottomed steamers force their way up the rapids, while Chinese junks—a feature of the Yangtse all the way from the sea—are hauled up by gangs of coolies toiling along narrow tracks in the face of the precipitous gorges through which the river flows. So strong is the current that sometimes the junks have to be unloaded and the cargo carried to a point upstream to which the empty junks can be hauled. The return voyage from Chungking to Ichang, though accomplished in only a fraction of the time, is even more hazardous. Wrecks are not uncommon, and the cost of the traffic, not only in money but in goods and human lives, is high. Yet still the traffic goes on, to meet the compelling needs of China's huge population.

In addition to the three giant waterways thus briefly characterised, there are many rivers—minor only in a relative sense—which play an important part as vehicles of travel and transport. Canals also play their part in China's vast economy, especially in the eastern plain. One great canal—the old Imperial Canal, dating from the seventh century—extends north and south for 700 miles. Starting in the south at Hangchow, at the head of the inlet south of the Yangtse estuary, it crosses both that river and the Hwang-ho, and finishes at Tientsin, which lies some distance up the Pei-ho and serves as the port for Peking.

Owing to popular prejudice against the foreigner and all his ways, railways were a late arrival in China. The first, built to connect Shanghai with its outport, Woosung, was not opened till 1876 and was bought in the following year in order that it might be torn up. Its destruction was a last despairing effort. In 1947, China had 10,000 miles of railway, including the South Manchurian line to Dairen and the Chinese Eastern Railway across Northern Manchuria—the Chinese section of the original Russian-built Trans-Siberian Railway. These two railways extend to nearly 2,200 miles, and another 2,400 miles are covered by a continuous sequence of lines providing communication from south to north—from Canton, *via* Hankow and Peking, to Mukden, the old Manchurian capital. Yet these and other lines are but a measure of the slow development of railway construction in China, for the total mileage in 1947 was no more than one-fourth of the mileage in the India of that year, in the closing days of the British *raj*. The building of roads for modern transport, as distinct from tracks for coolie porters or beasts of burden, was also a late development in China, but it has gone ahead more rapidly than the railways. The mileage of highways in 1947 was over 81,000, a typical example of the demands on enterprise being a motor road 2,500 miles long from Chungking, the capital of Szechwan and war-time capital of China, northwestwards to Chinese Turkestan (Sinkiang) and across that province to the Turkestan Siberian Railway.

Crops and livestock. China proper—the ancient China protected by the Great Wall—contains eighteen provinces. The whole of China, within the limits now generally recognised, has fourteen more. Five provinces have been set up in Manchuria, with which is also associated the province of Jehol, formerly regarded as part of Inner Mongolia. The latter region has been constituted an autonomous territory, comprising three more provinces. Yet another is Sinkiang (Chinese Turkestan). Eastern (Chinese) Tibet has long been divided into two more; and western Tibet, which claimed to be independent, or at least autonomous, came under Chinese control in 1951. If Formosa be added, the number of provinces is brought up to 32.

Until 1950, at any rate, the Food and Agriculture Organisation of the United Nations has been able to publish reports on the principal crops of China, prepared by the National Agricultural Research Bureau for 22 provinces, namely, the 18 original provinces, the three of Inner Mongolia, and the northern half of Chinese Tibet. These 22 provinces, covering nearly 2m. square miles, or rather more than half the total area, are estimated to support nearly 90 per cent. of the total population. Practically the only crop reports available for Manchuria are pre-war. Returns for Formosa are given separately.

Over 60 per cent. of all China is classed as waste or built-on, and 20 per cent. as pastoral country. The rest is nearly equally divided between forested country and arable land. China is so vast that the pastoral country, though only a fifth of the whole, extends to 750,000 square miles (over eight times the size of Great Britain), while the wooded and arable areas, though each less than a tenth of the whole, cover respectively 325,000 square miles (well over three and a half times the size of Britain) and 350,000 square miles (nearly four times the size of Britain).

Over 80 per cent. of the arable land is found in the 22 provinces, their share being reckoned at over 180m. acres. Wheat and rice are the two outstanding crops, occupying upwards of half this total. Wheat is the more extensively grown, covering 52½m. acres in 1949 against 45m. acres under rice; but the rice crop is double that of wheat, yielding in 1949 45m. tons against 22½m. tons. Wheat is one of the few crops for which post-war figures are available for Manchuria, where around 1½m. acres are under cultivation, yielding a crop of around three-quarters of a million tons—this being additional, of course, to the figures quoted for the 22 provinces. Other food crops grown in the 22 provinces, though on a less extensive and less productive scale, are among the leading sources of world supply of their respective products, and in some cases head the list, exclusive of Russia, as largely an unknown quantity. The 22 provinces are, or have been, the largest producers of barley

—7m. tons from 15m. acres. More than half the world's maize is grown in the United States (80–90m. tons), but the 22 provinces come second, with crops of 6–7m. tons from 12–13m. acres. They have the biggest crop of millet (7–8m. tons from 16m. acres) and rival India in the production of sorghum (5–6m. tons from 10½m. acres). Sweet potatoes, grown on 7–8m. acres, yield a crop of 20–25m. tons, rivalling China's wheat crop in weight and amounting to about half the world supply. Dry peas, dry beans, and broad beans each provide 2–3m. tons from 7–8m. acres. Rape seed is grown in the 22 provinces on 14m. acres, yielding 3m. tons, and the figures for sesame seed are about one-fourth as great.

Before the Second World War, China (including Manchuria) produced 80 per cent. (9–10m. tons) of the world supply of soybeans, and though the United States has since become a large producer, China still held the lead in 1949 with nearly half (6½m. tons) of the world total. Some 30 per cent. (3m. tons) of the world supply of ground-nuts also come from the 22 provinces, a proportion exceeded only by India. Cotton is another important crop, grown on 5–6m. acres, yielding a million tons of cotton seed and from a third to half a million tons of ginned cotton. Nearly a million acres are under sugar, yielding 5m. tons of cane, from which nearly 400,000 tons of raw sugar are extracted. The production of tea has fallen off considerably in the 22 provinces—from a pre-war average of 41,000 tons to 12,000 tons post-war. From a half to three-quarters of a million tons of tobacco is produced from 1¼–1½m. acres.

In respect of livestock also, China ranks high among the countries of the world, though, having regard to her vast size, she is less heavily stocked than many countries, except in the case of pigs, which numbered 60m. before the Second World War and were returned at the same figure in 1948—the latest available return. In general, livestock numbers were reduced considerably during the war. Cattle fell from 23m. to 18m., sheep from 12½m. to 10½m., goats from 22m. to 14m. Horses and mules were down by half, the post-war numbers of each being about 2m.; but asses, with 8½m., were nearly as many as before the war. Buffaloes were 2m. fewer, but still numbered 9½m.

Mineral wealth, though known to be considerable, has been little exploited. Coal-fields are found in most of the provinces, and much of the coal is of excellent quality; but production, which in the war year 1944 was worked up to 26m. tons (a small fraction of British production), dropped again to 16m. tons in 1949. The main fields are in the province of Shansi, the southern half of which, on the loess plateau (2–3,000 feet above sea-level), has enormous deposits both of anthracite and of bituminous coal. South-east Shansi forms one of the most remarkable mineral regions in the world. The anthracite extends over an area of about 13,500

square miles, but true anthracite occurs chiefly in two groups, and most of the deposit is only half-anthracite with from 87 to 89 per cent. of carbon and much ash. While the average aggregate thickness of the coal-seams is at least 40 feet, almost everywhere is to be seen a seam of from 15 to 20 feet, and often one of from 20 to 30 feet in thickness. So frequently does the productive part of the coal-field crop out on the surface that along one line, about 200 miles in length, an opening might be made direct into a seam of great thickness almost anywhere. The stratification seems to be undisturbed, and in many places it is nearly horizontal. Where the seam of from 20 to 30 feet in thickness crops out, with an easterly slope only just sufficient for drainage, level adits could be tunnelled for miles to the west, so that once a railway had been constructed to the surface of the plateau the wagons could be run into the mines and loaded with coal for Peking or Shanghai direct.

The iron ores of Shansi are of very good quality, and have been for hundreds of years the basis of a Chinese iron industry on a small scale; but their mode of occurrence, mostly in nodules of a few pounds to a few hundred pounds in weight, is not favourable to the development of a large industry of the modern type. Elsewhere in China proper are many deposits of iron ore, notably in Hupeh and Szechwan; but the largest deposits are in Manchuria. Yunnan is rich in copper, and to a less extent in silver, and has tin and other mines in the south-east of the province. Of the rarer minerals, China is an important contributor to the world supply of antimony (8,000 tons of 'Regulus' in 1947; chief source of supply, Hunan), and in the immediate post-war years she also had a variable annual production of tungsten concentrates, ranging between 2,000 and 9,000 tons.

For many years **trade** has had to contend against abnormal conditions—foreign wars at home and abroad, civil strife, political decay, depreciating currency, and finally the virtual closing of ports and marts to the merchant enterprise of the Western Powers. Trade returns by value for one year have little relation to the figures for other years, owing to the violent fluctuations of exchange rates and the introduction from time to time of new currency units in the endeavour to promote financial stability. Here it may suffice to note the chief products entering into trade in 1948, the latest year for which returns are given in the United Nations' *International Trade Statistics*. The chief imports by value were raw cotton (12½ per cent.), electrical and other machinery and tools (11 per cent.), iron and steel (6½ per cent.), chemical and pharmaceutical products (6 per cent.), and vehicles of all kinds: aircraft, locomotives, railway and tramway equipment, motor-cars and lorries, &c. (between 3 and 4 per cent.). Exports were easily topped by cotton piece goods (30 per cent.), after which came tung oil (10

per cent.), cotton yarn (9 per cent.), and pigs' bristles ($7\frac{1}{2}$ per cent.).

Chief towns. Officially China comprises (1953) the 32 provinces previously noted, and 13 municipalities. Both numbers are subject to change. The 13 municipalities and their populations (1950) are:

	<i>Thousands</i>		<i>Thousands</i>
Shanghai . . .	5,407	Chungking . . .	1,100
Peking . . .	2,031	Dairen . . .	1,054
Tientsin . . .	1,795	Nanking . . .	1,020
Mukden . . .	1,551	Sian . . .	559
Canton . . .	1,496	Fushan . . .	233
Wuhan . . .	1,200	Anshan . . .	185
Penki . . .	94,000		

It will be seen that many important towns—Amoy, Chefoo, Hankow, Ningpo, &c.—some of them larger than some of those listed above, are not included among the municipalities.

Macao. Dating from the days of Portugal's world expansion, and now approaching its fourth centenary, Macao lays undisputed claim to be the oldest foreign colony in the Far East. It is a miniature affair, nearly 40 miles west of Hong Kong, on the opposite side of the entrance to the Pearl river, occupying half a dozen square miles of a pleasant peninsula and including a port which attracts a good deal of small shipping, with a population of some 200,000, mostly Orientals. Tolerated by the Chinese Government, which displays towards it none of the bitterness manifested against Hong Kong, it has something of the reputation of an Eastern Monaco, practising a few manufactures, principally firecrackers and matches, and having a considerable fishing industry, but with a curiously unbalanced trade. With exports valued at rather more than a million sterling, Macao is credited with imports of five times that value. It shares with Portuguese Timor a distinctive unit of currency, the pataca, equivalent to Escudos 5.60.

FORMOSA

Formosa ('Beautiful') or Taiwan—to use the Chinese name for the island where the former Government of China still asserts its claim to that title and maintains an administration with United States support—lies about 100 miles from the mainland off the south-east coast. It is nearly 250 miles long, with an average width of about one-fourth of that distance, and has an area of close on 14,000 square miles, or about twice the size of Wales. Through its length runs a magnificent mountain range, with richly wooded slopes and peaks rising to nearly 13,000 feet. On the east side of the island the coastal belt is narrow and the coast rock-bound, but

on the west the lowlands are wider and are bordered by mud-banks, fed and extended by the silt brought down by the rivers in flood. The highlands and the east of the island are the home of wild tribes with Malayan affinities; the western lowlands have been settled by Chinese, Formosa having been a possession of China since 1683 except for the half-century 1895-1945, when it was held by Japan. A census in 1950 gave the population of the island as 7.6m., exclusive of the forces which had remained faithful to the old Government of China when it took refuge in Formosa.

About 60 per cent. of the country is classed as forest and woodland, and 15 per cent. as built-on or waste. Practically the whole of the remaining 25 per cent., comprising over 2m. acres, ranks as arable land, only 150,000 acres being occupied with permanent meadows and pastures. The arable land is extremely fertile, so much so that Formosa used to be described, with an exaggeration which at any rate stressed its fruitfulness, as 'the granary of China.' Two harvests of the chief food crops, rice and sweet potatoes, are reaped annually, and the areas assigned to individual products in the *Year Book* of the United Nations Food and Agriculture Organisation are, in the aggregate, half as large again as all the arable land (2m. acres) in the island. In 1949, 1½m. tons of rice (paddy) were reaped from over 1.8m. acres, and 2m. tons of sweet potatoes from half a million acres. In the previous year, 6m. tons of sugar-cane, yielding over half a million tons of raw sugar, were harvested from 300,000 acres. Other crops included ground-nuts (170,000 acres), tea (86,000 acres), bananas, wheat, jute, and tobacco.

Livestock include over a million pigs and 250,000 buffaloes, but as might be surmised from the small proportion of pasture land, there are comparatively few cattle and sheep.

The island has extensive coal measures, and over 1½m. tons were produced in 1948. Other mineral products include gold and silver, sulphur and copper. Narrow-gauge railways traverse the coastal belts on both sides of the island, and numerous private lines serve the sugar estates. Ports are mostly poor and silted; the best is Ki-lung (Kürun) at the northern end of the island. It is the port for Tai-pei, the largest town, which had a pre-war population of a third of a million. The chief town in the south is Tainan.

KOREA

Korea (the Japanese *Chosen*) occupies a long and comparatively narrow peninsula (roughly 500-600 miles by 150 miles), stretching out from Manchuria towards the extreme south-western end of Japan and almost shutting off the Sea of Japan from the Yellow

Sea. Under the loose suzerainty of China for centuries, though having its own sovereign, Korea became a dependency of Japan early in the present century. After the Second World War it was occupied temporarily by Allied Forces pending arrangements for establishing its independence, the northern half of the country being in Russian occupation and the southern in American occupation, with the 38th parallel as the dividing line. Failing agreement between the Allies on the prospective arrangements, two republics, North and South, were established and the foreign troops were withdrawn. In 1950 South Korea was invaded by the Northern Forces; the United Nations espoused the cause of South Korea, and there was active warfare till an armistice was arranged in 1953.

A thickly wooded mountain range forms the backbone of the country, bordering for the most part the east coast, but finally swinging round into the south-west corner of the peninsula. In the north, extensive fields of lava, one as much as 40 miles long and 100–140 feet thick, are evidence of ancient volcanic activity; and on the northern frontier the range reaches its greatest height in Peh-tan-shan (Paik-tu-san), the Long White Mountain, rising to 8,500 feet. The east coast is rocky, with few harbours, and rivers are short and rapid; but on the western side of the peninsula the mountains drop to a fairly wide coastal plain, through which the principal rivers wind their way to the sea, here lined with mud-flats and fringed with numerous islands, ice-bound in winter and subject at other times to very high tides, which rise as much as 40 feet. The soil in the valleys and plains is fertile, growing a wide variety of crops—in the south and centre, principally rice at the lower elevations and millet, beans, wheat, maize, cotton, and tobacco in the upland valleys; while in the bleaker north the rice-fields tend to give place to barley, oats, and potatoes. A distinctive Korean crop is ginseng, a plant famed in the Far East for the medicinal properties of its root.

Minerals are widespread but have been little developed, though gold is a regular export, and a large coal-mine is noted as a source of anthracite.

The total area of Korea is usually reckoned as about 85,000 square miles, or little less than that of Great Britain. North Korea is the larger part, with an area according to this computation of 49,000 square miles (nearly the size of England), leaving 36,000 square miles for South Korea (rather less than Scotland and Wales combined). In the *Year Book* of the United Nations Food and Agriculture Organisation, the total area is given as only 79,000 square miles, with a population of over 29m. before the outbreak of war between North and South. South Korea, though the smaller part, was credited with over two-thirds of the total population. The following estimates are based on the F.A.O. figures.

Over three-fourths of the country is classed as forest, and over a fifth as arable land, the surprisingly small proportion of under 2 per cent. being described as waste or built-on. Rice is far and away the biggest crop. Of Korea's 11m. acres of arable land, rice occupied 4m. acres before the Second World War (the latest period for which returns are available), yielded an average crop of 3.7m. tons of paddy, and provided half of Korea's exports. Trade was mostly with Japan, which still dominated Korea and found in it a useful source of food supply. South Korea provided three-fourths of the paddy acreage and crop, and was still producing on much the same scale after the Second World War. Both in 1948 and in 1949 South Korea reported paddy crops of over 3m. tons from $2\frac{1}{2}$ to $2\frac{3}{4}$ m. acres.

Barley ranks second among the crops. Before the Second World War it was grown on $2\frac{1}{2}$ m. acres yielding 900,000 tons, South Korea being credited with 85 per cent. of the acreage and 90 per cent. of the crop. In 1948, the total area under barley was estimated at less than 2m. acres and the crop was down to 650,000 tons; South Korea still provided much the greater part of both the acreage and tonnage, and in 1949 it alone had nearly $1\frac{3}{4}$ m. acres under barley, yielding nearly three-quarters of a million tons.

Soybeans and millet were close rivals for third place among the crops before the Second World War, each having around 2m. acres under cultivation and yielding over half a million tons. South Korea provided half the soybeans, but North Korea was the major factor in the production of millet. In neither case were returns available for North Korea after the war, and those for South Korea were on a smaller scale, though they were improving before the conflict between North and South.

Wheat is not a crop of the first importance, and is rather more widely cultivated in the North than in the South. Before the Second World War a total of over three-quarters of a million acres yielded nearly a quarter of a million tons; in 1949 South Korea produced 100,000 tons from 250,000 acres. Potatoes, a much heavier crop than wheat, though not very prolific in Korea by European standards, yielded 650,000 tons from a quarter of a million acres before the World War. Since that war, South Korea has been producing over 200,000 tons a year from rather more than 100,000 acres, and until the North Korean invasion she was producing much larger quantities of sweet potatoes from about the same acreage.

Cotton was grown on half a million acres before the World War, producing 70,000 tons of cotton seed and half that quantity of ginned cotton. In 1949 South Korea alone had a third of a million acres under cotton, producing nearly 60,000 tons of seed and 30,000 tons of ginned cotton.

No livestock figures for the whole country are available beyond

1939. Apart from poultry, only cattle (1.7m.) and pigs (1.4m.) were then returned in large numbers (fully half in South Korea); none of the other livestock numbered 50,000. In 1950-51 South Korea had less than 400,000 cattle and only 165,000 pigs.

The foregoing data may suffice to give some idea of the productivity of Korea, particularly South Korea, before the fratricidal strife into which the country was plunged in 1950. The intervention of the United Nations on the one hand, and of China aided by Russia on the other, introduced into the conflict large-scale factors which have had devastating effects on industry and trade. Normally, North Korea is the home of such heavy industry as the country possesses, while South Korea has large numbers of small factories. The concentration of the population in the centre and south is emphasised by the distribution of the large cities. In 1950, Seoul, the Southern capital, had an estimated population of over 1½m.; Pusan, the chief port, in the south-east corner of the peninsula, over against Japan, had about half a million; and two other cities in South Korea, Taegu and Inchon, each claimed about a quarter of a million. In North Korea, the capital, Heijo (Pyeng-Yuang), had a population of around 300,000. The war of 1950 onwards brought about many changes in this as in other respects. Seoul was reduced in the fighting to a mass of rubble and skeleton buildings, and when the United Nations re-occupied it in the spring of 1951 its population was estimated at only 50,000. A year later, with refugees trickling back in defiance of regulations to the contrary, it was estimated at three-quarters of a million. Meanwhile Pusan, which had become the provisional capital, had so increased in numbers that it was the largest city in the country.

Amid all these fluctuating conditions, South Korea is trying to rebuild its economy. It has been buying ships for a mercantile fleet, and in June 1952 the Korean Minister in Paris announced, after one such purchase, that South Korea had thirty vessels of under 3,000 tons and seven ships of over 3,000 tons.

JAPAN

The island-empire of Japan, which except for the extreme north-east corner of the Soviet Union is the most easterly country in Asia—'The Land of the Rising Sun'—has developed in a hundred years from an isolated, exclusive community, having few contacts with the Western world or knowledge of its inventions, into one of the leading world Powers. Breaking out from her seclusion and pursuing a policy of territorial expansion, embarking on a career of competitive industry and world trade, Japan was one of the victors

in the First World War, had the reverse experience in the Second World War, was shorn of her extraneous possessions—Formosa, Korea, Manchuria, and various Trustee island groups in the Pacific, but was restored to the comity of nations in 1952 when peace treaties with the Western Powers became operative.

Reduced to her original island-empire, Japan now comprises four principal islands strung along an arc, whose inner curve, facing Korea and Asiatic Russia, encloses the Sea of Japan, while the outer curve confronts the open Pacific Ocean. Centrally situated along the arc, and forming nearly the whole of it, is the long and comparatively narrow island of Honshu, otherwise known as the mainland, which is as large as Great Britain (89,000 square miles) and more than half as large again as the other three islands together. To the north of it lies Hokkaido (the old Yezo), about the size of Scotland (30,000 square miles); off its south-west coast, bordering and largely forming the famous Inland Sea of Japan, is the smallest of the four principal islands, Shikoku, about the size of Wales (over 7,000 square miles), and south of that again is Kyushu, more than double the size of Wales (16,000 square miles). The total area of post-war Japan is 142,000 square miles, and the total population (1952) 84m., so that Japan is rather more densely populated (590 to the square mile) than Great Britain (550 to the square mile).

The whole group is both mountainous and volcanic, containing upwards of fifty active, besides numerous extinct, volcanoes. The highest peak is the famous Fuji-yama (12,390 feet), whose beautiful snow-capped cone is visible from Tokyo, 60 miles away. Like other highly volcanic regions Japan is much subject to earthquakes, which often do immense damage. The surface is extremely irregular, and though the mountain passes are low, relatively to the height of many of the peaks, the slopes are generally steep. This has proved a hindrance to the construction of railways, and out of rather more than 12,000 miles of State railways in 1948, nearly 11,000 were only single-track lines. Also, though there are over half a million miles of roads, less than 1 per cent. are classed as 'national' roads, fit for heavy motor traffic. One difficulty in the way of their construction and maintenance is presented by the character of the climate and the natural drainage. During the rainy season the copious rains that deluge the mountain slopes cause frequent destructive floods in the numerous short rivers that descend on both sides. Many roads are then almost impassable. These conditions have hindered the growth of motor traffic. Whereas the smaller and less densely populated country of Great Britain had in 1950 over 2.2m. motor-cars and over 870,000 goods vehicles, Japan in the same year had 25,000 cars and 106,000 trucks.

Climatic conditions vary considerably, being affected by (1) the

latitudinal extent of the islands, which are spread over some 15° (from Land's End to John o' Groats is less than 9°); (2) their situation on the eastern side of the vast land mass of the Old World (see p. 46); and (3) their insular character and narrow width, fronting on the one hand the open Pacific, with its warm currents, and on the other the almost enclosed Sea of Japan, swept during the winter monsoon by north-west winds which beat on the flat and dangerous western coast and practically stop shipping. The coasts of all the islands are much indented and have an estimated length of 10,000 miles, or including the many adjacent small islands, 17,000 miles. The south-east winds of the summer monsoon, coming from the Pacific, drop their moisture on the mountainous uplands of Japan, which everywhere has a heavy rainfall, ranging from 40 inches in the north to double that quantity in the south. There is much snow in winter, especially in the north and along the west coast; in Hokkaido, the northernmost island, mean January temperatures are well below freezing point; southward they range up to 40° or a little more. In August the mean temperature range is from 70° in the north to 80° in the south.

Primary production. It is not surprising that in a land with these physical characteristics, barely one-sixth of the whole is classed as arable country—some 15m. acres out of over 90m. acres. Built-on and waste areas account for nearly another sixth, but the mountains are largely wooded, and two-thirds of the whole ranks as forest. There remains only between 1 and 2 per cent. for open pastures; but the forests include a million acres—a little over 1 per cent.—of 'wooded pastures' as they are called, so that nearly 3 per cent. in all is suitable for grazing. Livestock are not a factor of prime importance in Japanese farming, though there were some notable increases after the Second World War, compared with the pre-war figures. Sheep, approaching half a million in 1951, were four times as many as in 1938,⁷ and goats, exceeding the half-million, were about double the 1938 figure, while cattle, the most numerous of the larger livestock, had increased from 2m. to 2½m. Pigs, which were mostly killed off during the war, had multiplied to nearly half a million in 1951, but were still less than half the pre-war figure, and horses, numbering over a million, were also fewer than before the war.

Timber is worked on a large scale, production amounting to 5½m. board feet in 1946-47; but agriculture plays the biggest part in rural economy. The arable land is not only a small percentage of the whole, but is distributed in many scattered areas, chiefly around the coasts. Tokyo, on the south-east coast of Honshu (Mainland), lies in a fairly extensive plain, but for the most part the tracts of low-lying land are narrow coastal belts, mostly divided into small peasant holdings, as also are the upland valleys, with

their terraced hill-sides. Some $3\frac{1}{2}$ m. peasant households wrest a subsistence from holdings of less than $2\frac{1}{2}$ acres—most of them little more than an acre. In 1949, out of a total working population in Japan of 37m., aged 14 years and over, close on half were engaged in agricultural operations, including forestry.

The outstanding crop, occupying more than half the arable land, is rice. In 1950 the area returned as under rice was $7\frac{1}{2}$ m. acres, and the crop amounted to 12m. tons of paddy, vying with the crop in Pakistan and exceeded only in China and India. The limit of cultivation is reached in northern Hokkaido, where a single crop is grown with difficulty in a year; but at the other end of Japan the fertile Kochi plain, on the south coast of Shikoku, is capable of producing two crops a year.

The next largest, though much smaller, crops are barley, wheat, and potatoes. As in the case of rice, the 1950 crops were fully up to, and even beyond, the pre-war average. Barley was grown on $2\frac{1}{2}$ m. acres, yielding 2m. tons; the area under wheat, approaching 2m. acres, bore a crop of $1\frac{1}{3}$ m. tons; while potatoes, together with sweet potatoes and yams (the last two being lumped together in the returns of the Food and Agriculture Organisation), produced nearly 8m. tons of tubers from over $1\frac{1}{2}$ m. acres.

No other crops approached these in magnitude in 1950, but there was a great variety, and though for the most part they are not only relatively small but much below the pre-war standard, a few call for special mention. Soybeans were grown on 650,000 acres and produced a quarter of a million tons. Fruit does well, and the orange crop is particularly notable, amounting to 4-500,000 tons, rather more than half being Satsuma oranges, so-called after the district of that name in the extreme south of Japan; they are a loose-skinned variety akin to the mandarin orange, and were introduced many years ago into the United States, where they are now widespread in the Gulf States. Tea, prepared for export as green tree, is grown chiefly between 34° and 36° N. latitude, that is, in the south of Honshu (Mainland). The crop has declined by about one-third from its pre-war average, and in 1949 was down to 30,000 tons from 60,000 acres. Tobacco, on the other hand, was up by about one-third, with a crop of 84,000 tons from 124,000 acres.

Mulberry trees, whose leaves are required for feeding silkworms, are planted in more than three-fourths of the provinces, everywhere in rows, allowing of space for other crops between. Silk was once the leading export, and is still high up in the list. The lacquer-tree (*Rhus vernicifera*, D.C.), which furnishes the material employed in lacquering, one of the most celebrated of old Japanese industries, is cultivated mainly in the northern part of Honshu (Mainland), between 37° and 39° N. Camphor, extracted from the stem and roots of the camphor tree, which attains to a circumference of 50

feet, is another of the ingredients used in lacquering, and is also a minor export. The camphor tree is found mainly in the south-west of Japan.

Fisheries and mineral wealth. The Japanese fisheries are an asset of immense importance. A Fisheries Report to a United Nations Commission in 1945 reckoned that before the Second World War the Japanese Empire not only headed the countries of the world in its annual production of fish, but provided nearly one-third of the estimated world production of 18½m. tons of both sea- and fresh-water fish. The war has curtailed both the scope of the Japanese fishing grounds and the size of the fishing fleet, but the industry remains one of the first importance, Japan itself producing more than any other country (see p. 249). Sardines, bonitos (mackerel family; genus *Sarda*), and herrings are prominent features of the inshore catch, while the deep-sea trawlers have for their field of operation one of the greatest demersal or ground fisheries in the world. In 1948 the fishing fleet included nearly 20,000 vessels, or less than one-twelfth of the pre-war figure; but in the following year the catch from deep-sea fishing was returned as nearly 3m. tons, or about half the pre-war total. A share in the post-war Antarctic whaling industry has been accorded to Japan, the catch in 1949-50 being 4,750 whales yielding 34,000 tons of whale oil.

The mineral wealth of the islands is varied, but not specially abundant or highly developed. Intensive production during the Second World War led to record output in many cases. This was followed by a big drop after the war, but returns increased again up to 1950, the latest year for which statistics are available. Coal is the most notable product with an annual normal output of about 40m. tons (one-fifth of the output in Great Britain), chiefly from mines in Hokkaido, the northern-most island, and around Moji and Nagasaki in north-west Kyushu, the southernmost island. Iron ore is found in south-west Honshu (Mainland), and iron sand in Hokkaido. In 1950 the total production was about 900,000 tons, including some 90,000 tons of iron sand. For the most part the iron ores are not easy of access, but iron and steel works at Wakamatsu, on the north coast of Kyushu, where only the narrow straits of Shimonoseki separate Kyushu from Honshu, are within 20 miles of both coal and iron mines. Large iron and steel works were also established before the war in Hokkaido. The industry is largely dependent, for its full development, on ores imported from China. In 1950 the production of pig-iron and ferro-alloys amounted to over 2½m. tons.

High-grade copper ores are found at Ashio, near to Nikko, in central Honshu, about 75 miles north of Tokyo. Ore production in 1950, in terms of metal, was close on 40,000 tons. Altogether, Japan's primary production of copper in that year was nearly 37,000

tons and the amount of secondary metal recovered nearly 47,000 tons. The output of manganese ores was nearly 140,000 tons, with an estimated manganese content of over 50,000 tons. Other mineral products included aluminium (25,000 tons), refined sulphur (90,000 tons), silver ore (in terms of metal, 3.7m. fine troy ounces), and gold ore (in terms of metal, 132,500 fine troy ounces).

Industrial and commercial development. Industrially, Japan has employed to the full her marked imitative faculties, and there are few manufactures of the Western world which she does not produce on her own account. Prominent among big industries are the iron and steel works to which reference has already been made, ship-building, and textiles; before the Second World War, Japan was in the front rank of countries manufacturing rayon. During the war, production was intensified along lines affecting the war effort, but Japan's ultimate defeat brought her industrial output down with a run; in 1946 it was reckoned at only one-third of the pre-war standard. Restrictions and control were imposed by the Supreme Command of the Allied Powers, but there has been a gradual recovery. At the turn of the half-century, the position in some leading manufacturing industries was still much below normal. The following figures show the returns in or around 1950, compared with the pre-war returns (in brackets); though in any comparison, account must be taken of the post-war curtailment of the Japanese Empire.

Cotton. Cotton yarn spindles working at end of 1949: 3.7m. (13m.); output of yarn in 1950: 470m. lb.; output of cotton cloth: 1,542m. square yards.

Wool. Worsted spindles in 1949: 655,000 (1.6m.); looms: 14,000 (29,000); output of woollen yarns in 1950: 71.5m. lb.; of woollen and worsted cloth: 69.2m. square yards.

Silk. Production in 1950: 148,000 bales, of which nearly two-thirds were exported; also exported: 60,500 square yards of silk tissues. During the Allied occupation arrangements were made to plant 50m. mulberry trees, with a view to increasing production to a quarter of a million bales.

Rayon. Monthly output of filament yarn: June 1950: 7m. lb. (25m. lb), June 1951: 13m. lb.; of staple fibre, June 1950: 12m. lb. (25m. lb), June 1951: 22m. lb.

Other important groups of industrial products are chemicals, metal goods, and lumber and wooden articles. The use of electric power is developing; Japan's short, rapid rivers are a potential source of widespread supply, and 80 per cent. of the power consumed is derived from hydro-electric plants. Altogether over 3m. workers are employed in industrial establishments, and according to the United Nations' system of calculation the index of production, represented by 100 in 1937 and dropping to 34 in 1946, had increased to 77 in 1950 and was back to the pre-war standard in 1951.

The decline in the value of the yen (the unit of Japanese currency) even before the war, the effects of the war on industry and commercial relations, and the post-war limitation of Japan to the four main islands, all tend to lessen the comparative value of the trade returns over a period of years. In the days of stable currencies, before the First World War, the yen was the equivalent of about 2s., or 48 U.S. cents. Between the two World Wars, in the thirties, it dropped to roughly half that value. During and after the second war there were no regular quotations till in April 1949 one cent was made equivalent to 3·6 yen for all permitted trade. At this rate 1,000 yen were worth close on \$2·78, which, later in 1949, became practically the exchange rate of the devalued £ sterling. More exactly, the £ was equivalent to 1,008 yen, but in the following summing up of Japanese trade in 1949 and 1950, the sterling value of imports and exports has been calculated, for purposes of ready reckoning, at 1,000 yen to the £.

In both years trade showed a considerable and progressive measure of recovery from the immediate post-war 'slump.' The c.i.f. value of general imports jumped in 1949 to £284m., and this was further increased in 1950 to £334m. Similarly the f.o.b. value of general exports jumped in 1949 to £169m., and in 1950 amounted to £298m. In either year foodstuffs accounted for over one-third of the value of the imports, including round about 2½m. tons of cereals, principally wheat. Raw cotton is largely imported for manufacture and re-export in the form of cotton fabrics. In 1949 the imports of raw cotton were valued at £44m. (15 per cent. of the total), while in 1950 their value amounted to £93m. (28 per cent. of the total). Other imports to the value of over a million sterling, ranging up to 10–20 millions—all more or less in the nature of raw materials—were wool, fertilisers, mineral oils (crude petroleum, fuel oil, lubricating oil), coal, rubber, pulp, and hides and leather, with a combined value of over 20 per cent. of the total in either year. Nearly 2m. tons of coal were imported in 1949, but little more than three-quarters of a million tons in 1950. Manufactured goods, apart from some £2m. worth of machinery in 1950, did not figure among the leading imports. Easily the leading country of supply was the United States, which contributed over 60 per cent. of the value in 1949 and over 40 per cent. in 1950. The balance came chiefly from the countries of the Orient—China, Formosa, Thailand, Malaya, &c.—and (in 1950) from Australia, which, supplying nearly 8 per cent. of the total, ranked next to the United States.

Foodstuffs play a small part among the exports. Green tea, long fallen from its once high estate as Japan's second most valuable export, provided about £2m. of the total both in 1949 and in 1950, while in the latter year tinned and bottled foods, which were an

important export before the Second World War, revived to the extent of 25,000 tons valued at nearly £7m.—little more than 2 per cent. of the total. The big factors in the export trade, as before the war, were textiles. Cotton fabrics, valued at £74m. in 1950, accounted for 25 per cent. of the total exports in that year (in 1949 the proportion was slightly larger), while rayon fabrics (£18m.) and silk fabrics (£8m.) together made up between 8 and 9 per cent. Raw silk exports, though only a fraction of their pre-war quantity, totalled nearly 6,000 tons, valued at £14m. (nearly 5 per cent.); and minor items—cotton yarn (£6m.), rayon yarn (£2m.), and wool fabrics and knitted goods (£3m.) brought up the value of all these various textile exports to well over 40 per cent. of the total (in 1949 the proportion was 45 per cent.). For the rest, exports of machinery in 1950 were valued at £28m. (nearly 10 per cent. of the total), ceramic ware at £7m., and toys at £4m.; while cement, coal, and paper were each exported to the value of over a million sterling. The distribution of the trade was much the same as in the case of imports. The United States took the biggest proportion of the exports—nearly 20 per cent. in 1949 and over 20 per cent. in 1950. Most of the other exports were consigned to Far Eastern countries, the biggest customers (after the United States) in 1950 being Hong Kong (between 6 and 7 per cent.), Indonesia, Thailand, and Formosa. Outside that range of countries, the best customers were South Africa and Australia.

The great bulk of Japan's foreign trade passes through three ports on the south coast of Honshu (Mainland), namely, Yokohama, Tokyo's great outport at the south-east corner of the island, and Kobe and Osaka, both of which are situated near the centre of the south coast. Most of the ports of Honshu are on the south and east coast, notably Nagoya, situated between Yokohama and Osaka; Hiroshima, whose port has survived the city; and Kanmon, which includes Shimonoseki, at the south-west tip of Honshu, and Moji, at the northern tip of Kyushu. The combined port constitutes the western entrance to the Inland Sea, and the two towns, facing one another across a narrow strait, are linked both by a ferry service and by a submarine railway tunnel. Niigata is the only considerable port along the west coast, which, as already explained, is subject in winter to prolonged spells of adverse winds seriously interrupting navigation. Hokkaido, the northernmost island, has its chief port, Hakodate, at its southern end. The southernmost island, Kyushu, has, in addition to Moji, several important shipping points for coal and other minerals, notably Nagasaki.

Japan's large cities are nearly all ranged around its coasts, and many of them have been mentioned in the foregoing brief survey of leading ports. The most notable inland city is Kyoto, the ancient capital, in southern Honshu. In Hokkaido, Sapporo has an even

larger population than Hakodate; and, in Kyushu, Fukuoka and Kumamoto are large cities near the west coast but not themselves constituting ports. At the 1950 census Japan had two dozen cities each with a population of over 200,000, and some of them very much larger, viz.:

	<i>Thousands</i>		<i>Thousands</i>
Tokyo	6,277	Hiroshima	259
Osaka	1,956	Kanazawa (W. Honshu) .	252
Kyoto	1,102	Yokosuka (Tokyo Bay) .	251
Nagoya	1,031	Nagasaki	242
Yokohama	951	Shizuoka (S.E. Honshu) .	239
Kobe	765	Kagoshima (S. Kyushu) .	229
Fukuoka (N.W. Kyushu)	393	Hakodate	229
Sendai (N.E. Honshu) .	342	Niigata	221
Kawasaki (Tokyo Bay) .	319	Sakai (S.W. Honshu) .	214
Sapporo (Hokkaido) .	314	Himeji (W. of Kobe) .	212
Amagasaki (nr. Osaka) .	279	Gifu (South Cent. Honshu)	212
Kumamoto (Kyushu) .	268	Yahata	210

AFRICA

Of the six continents Africa is second in size (next to Asia) and fourth in population (not much below North America); but commercially it may be regarded as the least productive, having regard to its size, though its external trade is not absolutely the lowest. Unfavourable factors are its backward civilisation and natural unproductiveness—the latter attributable largely to the want of rain. Africa lies as a whole in latitudes where the atmosphere is always able to retain large quantities of vapour uncondensed. Its surface, like that of Spain, is made up mainly of plateaus with bordering mountains, so that the interior is in most parts reached only by winds that have been deprived of the greater portion of their moisture. The only regions with fairly abundant rainfall are certain parts of the equatorial region, narrow strips on the east and south-east coast, and part of the north coast in the neighbourhood of the Atlas Mountains. There are vast regions in the north and the south-west entirely desert, or nearly so, except where capable of irrigation. The only district possessing a really high density of population is a small part of Egypt, in the north-east.

Apart from rainfall, the soil is often far from fertile. Large areas in the Congo basin and elsewhere are covered with poor tropical red soils, including laterite, from which the valuable plant foods have been leached by rain. Improvident methods of cultivation and stock grazing by Africans have led to widespread soil erosion, devastating whole countrysides.

Transport difficulties have been another hindrance. Until the end of the nineteenth century Africa was mostly dependent on porters and pack animals. A camel caravan takes about three months to cross the Sahara, covering from 15 to 18 miles a day. In tropical Africa a caravan of porters travels at the rate of about 20 miles a day, the normal load for each porter being about 50 lb., though some carry up to 120 lb. Except along the main routes, only narrow tracks connect the villages, but these have proved very suitable for bicycles, which are now widely used by Africans. The present century has seen a big extension both of railways and of seasonal motor roads, with a more gradual increase of all-weather roads. Motor services can cross the Sahara in a few days, and air

services are numerous. Steamships have been placed on the great lakes and rivers; but the rivers are interrupted by rapids and falls which destroy their value as continuous commercial highways. Africa is a vast continent, and though much has been done there are large areas which are still very much at the back of beyond.

Above all, development is limited by the paucity and backward condition of the people. Inter-tribal warfare, slave-raiding, famine, disease, have all kept the numbers down and held up progress in the past. The future is brighter. European control has not only established law and order and brought material development, but has lessened the ravages of disease, till now the rapid increase in the population is giving rise to economic anxiety. In general, the climate of tropical Africa is enervating and unfavourable to prolonged strenuous labour. Malaria is prevalent in the lowlands, and even the highlands are not free from it; Europeans especially are subject to it, and Africans are not immune. But the discovery by Sir Ronald Ross of the connection between malaria and mosquitoes (*anopheles*), and between mosquitoes and stagnant water, has made it possible to eliminate many sources of danger. Still more dreaded pests are the tsetse flies (various species of *Glossina*) which carry the active agent of sleeping sickness in man and the corresponding disease, *nagana*, in cattle. They range over a large part of tropical and, in the east, sub-tropical Africa—between about 15° N. and 17° S. in the west, and between 4° N. and 27½° S. in the east. The degree of responsibility of big game for the prevalence of tsetse fly is still the subject of controversy. Other measures besides the wholesale slaughter of game, which some advocate, are bush clearance and the spraying of vegetation with insecticides from the air. Big hopes are now being built on a new drug, antrycide. Open grass-land is usually free from tsetse. (Cf. pages 67 and 242.)

Thus, in one way and another, many of the handicaps to Africa's progress, if not yet conquered, are being reduced. Population is on the increase; Africans allowed to exercise their talents are showing new capabilities; and if the continent is not one of the wealthiest or easiest to develop, it has latent resources of farm and forest products and of mineral wealth which the various Governments are eager to turn to account. At the close of the Second World War the British Parliament voted for Colonial Development and Welfare during the ten-year period 1946-56 a sum of £120m., of which Africa is getting a large share.

An important factor in the commercial development of Equatorial Africa has been the Free Trade Zone established by the European Powers at the Berlin Conference of 1885 in connection with their recognition of the Congo Free State (now the Belgian Congo). Nominally related to the Congo Basin, this treaty zone covers an even vaster area, extending across Africa from the Atlantic to the

Indian Ocean and embracing not only the Belgian Congo and adjacent parts of French Equatorial Africa, Portuguese West Africa, and Northern Rhodesia which fall within the Congo Basin, but the whole of Kenya, Uganda, Tanganyika and Nyasaland, with parts of the former Anglo-Egyptian Sudan, Italian Somaliland, and Portuguese East Africa. The treaty has been subject to various modifications since 1885, and both import and export duties are now levied within the zone; but the vital principle of equality of treatment among the signatories has been maintained despite criticism, and has had an important bearing on the course of African trade.

In the following section will be found a summary account of each territory within the continent, and of its present contribution to world trade.

EGYPT

This country was for a long period a province of the Ottoman Empire. In 1882 began a period of British influence. At the request of the Khedive an expeditionary force was sent out to suppress a rebellion of the Egyptian army. A British protectorate was established during the First World War, when the reigning Khedive was deposed and a successor appointed with the title of Sultan, but in 1922 Egypt was recognised as an independent sovereign state, the Sultan being proclaimed King. Thirty years later, in 1952, his successor was forced to resign in favour of his infant son as the result of a military coup d'état, whose leaders announced a programme of radical reforms, including the break up of the big landed estates and their sub-division among the *fellahin*. In the following year a republic was proclaimed (June 1953), with the head of the army as President.

The Anglo-Egyptian situation is complicated. British troops are stationed in the Suez Canal Zone. An Anglo-Egyptian Treaty in 1936 reserved for further discussion questions of mutual assistance against aggression, defence of the Canal Zone, and the future of the Anglo-Egyptian Sudan. The treaty was to be reconsidered in 1956; negotiations for its revision were begun in 1946, and both the exclusion of British troops from the Canal Zone and the re-establishment of Egyptian influence in the Sudan have since become key points of Egyptian policy.

The country extends from the Mediterranean Sea and the mouths of the Nile to Wadi Halfa in about latitude 22° N., a length roughly equal to the distance between the Scillies and the Shetlands. In the east it extends to the Red Sea and Israel, including the Suez Canal

(p. 639) and the Sinai peninsula, and in the west the boundary is an almost entirely straight line running north to south through the Libyan Desert. The area of the country is 386,000 square miles, but this figure is of little significance, since by far the greater part of the territory is uninhabited and uninhabitable. The settled area is about 13,500 square miles—between 3 and 4 per cent. of the whole; one-fourth the size of England—and of this some 6m. acres—under 10,000 square miles—are cultivated. The settled area comprises the tract capable of being irrigated by the waters of the Nile—the Nile delta and a valley varying in width from two to fifteen miles, lying between the deserts on either side—together with a few oases. On this area are crowded over 19m. people, who are almost entirely dependent upon agriculture. The result is a density averaging over 1,400 to the square mile and rising to much more in the delta region—a density almost unparalleled for an agricultural community except in parts of China. The total population of the desert country is only about 50,000 nomads.

Two thousand three hundred years ago the Greek geographer Herodotus aptly called Egypt 'the gift of the Nile.' Agriculture in Egypt certainly depends for its very existence upon the annual flooding of the Nile, for the annual rainfall at Cairo is only one inch, and at Wadi Halfa precipitation is seldom known to occur. This annual flood is the result of the summer monsoon rains occurring on the Abyssinian mountains. The perennial source of water in the lower Nile is the White Nile (Bahr-el-Abiad), a name which properly applies only to the main river from Khartoum up to Lake No (10° N.), where the Upper Nile—Bahr-el-Jebel (Mountain River)—is joined by the Bahr-el-Gazelle; but nowadays the name 'White Nile' is often loosely applied to the main river as far as the Great African Lakes. Supplementing this main supply, the annual floods are brought by the Blue Nile and the Atbara rivers, which rise in the Abyssinian mountains.

During the floods the Blue Nile has been found to be responsible for nearly 70 per cent. of the water in the Egyptian Nile, the Atbara for 17 per cent., and the White Nile for 14 per cent.; during the period of low water the White Nile provides over 80 per cent., and is thus the mainstay of the dry-season flow. The Nile in Egypt begins to rise about the end of June, growing turbid and red with the fertilising mud which it holds in suspension. By the month of September it has reached the top of its banks and begins to overflow, except where held in check by artificial embankments. In November and December it subsides again. At Cairo the rise is between 20 and 25 feet.

The methods employed for utilising this vast volume of water for the benefit of the crops have changed considerably in most parts of the country from those of the ancient inhabitants. But until

only about one hundred years ago the sole method was that of the Pharaohs—the method described by Shakespeare in the words which he puts into the mouth of Mark Antony:

The higher Nilus swells,
The more it promises : as it ebbs, the seedsman
Upon the slime and ooze scatters his grain,
And shortly comes to harvest.

It depends on the fact that thousands of annual floods have deposited silt brought down from Abyssinia to such an extent that the Nile banks in Egypt, below Aswan, are now slightly above the level of the surrounding floor of the valley. Cuts are made in the raised bank, and as the river level rises the water flows through on to the fields, which are arranged in a series of basins separated by embankments. The water remains on the land, depositing its valuable load of fertile silt, for six to eight weeks and is then allowed to run back to the river, the level of which has meanwhile fallen. The seed is then sown in the mud, and the crop is reaped before all the moisture is dried up. By this method of irrigation the soil was condemned to sterility for half the year, during which it was either under water or baked to a degree of hardness which made it impossible to grow anything. By it, too, only such crops could be grown as ripen within a short period—such as beans, clover, lentils, wheat, barley, and onions. Of far more economic importance is perennial irrigation, because it guards against the risk of a poor flood, permits of more than one crop being obtained in the year, and greatly extends the range of crops which can be grown.

Perennial irrigation of a kind has been practised from very ancient times, close to the river bank, by the use of the primitive 'shaduf,' a lever device for raising water from the river. The use of dams thrown across the river to store the water for irrigation purposes dates only from the early part of the last century. Mohammed Ali Pasha built a barrage across the Nile at the head of the delta to dam up the flood-water, which could thus be used to irrigate the fields for a much longer period than would have been possible under the old basin system. These works were extended under British influence; they consist of a pair of dams with sluices on the two main arms of the delta a little below Cairo. By their use a large part of the delta and the part of Egypt to the north-east of Cairo and the south of Zagazig have been made independent of the state of the Nile. The delta sluices are closed about February or March, and little water is allowed to escape to the sea between the time of closing and the commencement of the flood season in July. Large earthen banks called 'sudds' are built across the mouths to retain the water for irrigation. During the present century other barrages have been built at various localities on the river in Middle and Upper Egypt, the intention being to allow

the water in basins belonging to a group in one part of the valley to be supplemented in a low flood by canals led from the next group higher up. The greatest is the gigantic dam at Aswan, which, with its first subsidiary at Assiut, was opened in 1902 and has since been twice enlarged. The Nile valley for 200 miles south of Aswan becomes a huge reservoir, the filling of which is accomplished between November and January. The water is drawn off into the irrigation canals between March and July.

Invaluable as these works are in distributing the fertilising waters of the Nile as the river flows through Egypt, the problem of supply goes beyond the confines of that country. As already noted, the sources of the Nile are far away to the south—those of the White Nile in the Great Equatorial Lakes, and those of the Blue Nile in the highlands of Abyssinia. The masses of vegetation known as the *sudd*, which obstruct the progress of the White Nile northward in its middle course through the Sudan, are another potent factor. The regulation of the Nile waters in these higher reaches of the river have long been the subject of engineering and political study, and big developments are now in prospect. In 1949 an Anglo-Egyptian agreement provided for the construction of a dam at Owen Falls, in Uganda, near the outlet of the Nile from Lake Victoria, for the production of hydro-electric power and for the control of the waters of the Nile in conjunction with other important works lower down the valley. Negotiations for these other works have been started both in the Sudan and in Abyssinia. It is anticipated that the full development of the scheme will take something like 20 years. (See p. 681.)

One of the most striking results of the increase in the amount and reliability of irrigation water available has been the great increase in the population which can conveniently be supported. The census population of 19,090,000 in 1947 was nearly three times the number in 1882, at the beginning of British influence in Egypt.

Before the introduction of perennial irrigation, the agricultural year in Egypt was divided into three parts, the season of inundation, from June to October; the season of cultivation, after the subsidence of the waters, from October to February; and the harvest season, varying with the individual crops, from February to June. Only one crop could be obtained each year from a single patch of ground. The fertility was amply maintained by the annual deposit of silt, supplemented in respect of nitrogen content by the growing of beans, lentils, and particularly the Egyptian variety of clover known as *bersim*. Under the present regime, many new features have been introduced. In the first place, it is now possible to obtain two crops per annum of the old staples of Egyptian agriculture, the small cereals and pulses. The winter crops occupy the ground between October and April, and the summer crops between April and

October. Sometimes even an extra 'season' may be added, a quick crop of maize or millet being obtained between September and November. The following is a typical example of the succession of crops grown during a three-year period: Cotton is grown from March to the end of October, and is immediately followed by clover, of which perhaps seven cuts are taken; in the next eighteen months from July onwards two crops of maize and one of wheat may be reaped, the wheat being grown in winter and spring; the second crop of maize may be succeeded by clover, of which two cuts can be obtained before the ground is cleared once more at the beginning of March for cotton. Secondly, crops which require a rather longer season than was to be obtained under the old system are now able to be grown; such as cotton, now the most valuable crop of all, sugar-cane, rice, maize, and millet. Thirdly, the use of the water in irrigation canals instead of in floods over the fields has deprived the soil of its annual deposit of silt. This is the most serious drawback to perennial irrigation. The silt is now deposited in the river-bed and in the canals and reservoirs, and increased labour is involved in removing these deposits, which are piled up on the banks. This is of little moment, however, beside the loss of fertility which has resulted. Artificial fertilisers are having to be used in ever-increasing quantities in order to maintain crop yields. Egypt is fortunate in having two available sources of such material, the nitrates—known as 'tafla'—of the Nile valley between Keneh and Aswan, of local importance, and the more recently discovered and far more valuable field of phosphate rock on the Red Sea coast near Kosseir; but even so, chemical manures form an important item in the list of imports into the country, and the expense of these adds to the costs of agricultural production.

One feature of Egyptian agriculture which has scarcely been changed by the substitution of new for old methods of water supply is its comparatively primitive character. Mechanisation is obviously difficult if not impossible in a land where over two-thirds of the holdings are tiny compartments less than one acre in extent, separated one from another by mud-banks.

The principal commercial crop in Egypt is cotton. The plant was introduced into the country a little over a century ago by Mohammed Ali Pasha, the originator of perennial irrigation, and its cultivation has extended steadily ever since, very largely owing to two factors, the high quality of the product and the increased facilities for its cultivation in areas watered by the perennial canals. There are two main varieties cultivated. The finest, called *Sakellaridis* (or in the trade 'Sakel') has a silky lustre and a long staple of about $1\frac{1}{2}$ inches, qualities which make it second only to the famous 'Sea-Island' cotton (p. 172) of the West Indies. It is grown mainly in the delta. Of several other types the most important is *Ashmouni*, not so out-

standing as Sakel but still a good quality fibre, and even more prolific. This is the principal variety grown in Upper Egypt.

In the quinquennium before the Second World War, the land under cotton averaged over $1\frac{3}{4}$ million acres (just on a third of the total cultivated area), produced a crop of nearly 400,000 tons of ginned cotton, and supplied from two-thirds to three-fourths of the total value of Egyptian exports. During the war, when food crops had preference, the area under cotton dropped below $\frac{3}{4}$ m. acres. Naturally the lands retained for that crop were the best suited to cotton, and the average yield was more than maintained, never falling below the pre-war average of 480 lb. to the acre and usually exceeding 500 lb.; in 1942-43 it reached the remarkable figure of 570 lb. per acre. Even this was exceeded in 1948, when cotton cultivation was expanding again; in that year the yield was 588 lb. per acre. In 1950, with expansion continued and stimulated by high prices, the area cropped exceeded 2m. acres, but for the first time since 1938 the yield per acre was below the pre-war average; it dropped to 414 lb., and despite the large acreage the total crop was under 400,000 tons. The boom continued into 1951, and when excessively high prices provoked a reaction the Egyptian cotton market was overstocked with supplies which could not be sold except at a loss. The danger of having so many eggs in one basket was then apparent. Appeals were made to Government to take over the stocks and limit the loss; but far-reaching effects on the national economy could not be avoided, and general dissatisfaction and unrest contributed to the situation in which the reigning monarch was overthrown in 1952.

In any estimate of Egypt's standing as a cotton-growing country, it is necessary to bear in mind not only the high quality of the product but its high yield. The lowest of the figures quoted above, 414 lb. per acre, is much more than the highest figure for production in the United States up to 1950, namely 312 lb. to the acre in 1948. India averages barely 100 lb. per acre, and Pakistan's highest is no more than double that figure.

Egypt's other crops are mainly cereals and pulses—food crops whose war-time experience was the reverse of that of cotton; their acreage increased, but as the new land was not always the most naturally suited to them, the average yield tended to decline. Post-war experience varied with the crop. Wheat and maize reverted to the pre-war acreage and production—in the case of wheat about $1\frac{1}{2}$ m. acres yielding 30 bushels to the acre, a total of a million tons; and a rather larger acreage and crop in the case of maize. Barley not only declined from the level of war production but fell much below the pre-war average—from 280,000 acres to 120,000 acres in 1950, and from over 250,000 tons to less than 100,000 tons. Millet, on the other hand, did better than before the war, increasing its pre-war average

of 350,000 acres to over 400,000 acres in 1950, and its crop from 400,000 to 500,000 tons. Rice, though a variable crop, did better still, being grown on nearly $\frac{3}{4}$ m. acres in 1950, against a pre-war average of under $\frac{1}{2}$ m. acres, and doubling its pre-war production of 600,000 tons. There is a surplus of rice for export, but other cereals are insufficient for home needs, and wheat and maize have both been imported in considerable quantities since the war.

Other major crops include sugar cane, of which 2 $\frac{1}{2}$ m. tons yielding nearly 200,000 tons of raw sugar were produced in 1950; and broad beans, averaging over $\frac{1}{4}$ m. tons from some 400,000 acres. Onions are largely grown for export in a variety of forms (fresh, dehydrated, powdered, etc.), and potatoes are also exported. Animals are reared as part of the farming system, and at the 1947 census sheep, goats, cattle, asses, and buffaloes each numbered between one and two million, and camels nearly 200,000. Fodder is available in the form of *bersim* (clover), grown universally as part of the crop rotation. In the oases, the more important of which are Siwah, far out in the desert west of Fayum, Kharga, west of Esna, and Farafra, west of Assiut, the same food crops are grown, and in addition dates, of which the annual production is estimated at 160,000 tons.

Apart from its crops, Egypt's natural resources are not very considerable. Oil is found on both sides of the Gulf of Suez, and the production of crude petroleum has crept up to 2.3m. tons in 1950. It is refined at Suez, the output being mostly gas, diesel and fuel oils, in demand for shipping using the Canal. For a time after the Second World War prospecting was actively pursued, but no big development has resulted. Manganese ore, with a manganese content of 30 per cent., is mined in the Sinai peninsula and exported mainly to Britain for use in the steel industry. Output before the War was about 150,000 tons; for a time during and after the War it almost disappeared, but in 1950 it was back to its pre-war level. In the same year nearly 400,000 tons of phosphatic rock were produced, having a content of about $\frac{1}{4}$ m. tons of phosphate of lime, but this was below the pre-war production. There has been a steady increase in the output of gold, which amounted to over 10,000 fine troy ounces in 1950. Other minerals are known to exist, but either they are not in workable quantities or their situation is unfavourable to development.

Industry is mainly concerned with the processing of local products, such as the milling of wheat and maize, the extraction of sugar from cane, the refining of oil, and the manufacture of cotton, woollen, and silk fabrics. There are textile factories in several towns in the Nile delta, the headquarters of the industry being Mehalla el Kubra, a town of over 100,000 inhabitants.

Notwithstanding this development, the great bulk of the cotton grown in Egypt is exported after ginning. In 1950, when Egypt's

national exports had a total value of £E173m.¹ the exports of raw cotton were valued at £E150m.—70 per cent. of the total. It is characteristic of the effect of the War on trade that while this value of Egypt's cotton exports was seven times what it was in 1938, the quantity (380,000 tons) was less than 10 per cent. above the 1938 figure. All other exports of Egyptian national produce are relatively insignificant. Next in export value to cotton in 1950 were rice (£E7½m.; less than 5 per cent. of the total), onions (£E2m.; 1·2 per cent.), and oil products (nearly £E2m.; 1·1 per cent.). The only other export exceeding £E1m. in value was phosphate of lime.

Imports for use in Egypt are not dominated by any single factor. In 1950 they were valued at £E196m., of which foodstuffs accounted for £E36m. (18 per cent.), more than half the latter amount being for imports of wheat, flour, and maize. A noteworthy feature of this class is the increased popularity of tea, maté, &c. Imports in 1950 were double the quantity in 1938, and the value assigned to them was increased eightfold. Machinery and transport equipment provided about 15 per cent. of the total, apart from iron and steel bars, sheets, tubes, &c., which were responsible for another 5 per cent. Fertilisers were imported to the value of over £E12m. (6 per cent.), largely nitrate of soda from Chile; and it may be noted, as bearing out what has already been said about the increasing need of fertilisers to maintain the crops, that the quantity imported in 1950 was nearly four times as much as in 1938. Kerosene, fuel oils and coal made up approximately another 5 per cent. of the total, as also did wool fabrics and cotton piece goods. The largest single item next to wheat, was wood for building, this alone being valued at nearly £E8m. (4 per cent.).

The bulk of the foreign commerce is concentrated upon Alexandria, the ancient port named after Alexander the Great, situated at the north-west extremity of the delta, away from the silt, which is swept eastwards by currents. Actually, about 80 per cent. of the import trade and 90 per cent. of the export trade of Egypt pass through this port. The remainder of the trade is divided between Port Said, the great coaling-station and entrepôt for Far Eastern traffic at the Mediterranean entrance to the Suez Canal; Suez, at the southern end of the canal; and overland routes to and from the Sudan. The capital, Cairo, situated on the right bank of the Nile at the head of the delta, was a natural converging point in the past for caravan routes, as it now is for rail and air routes. Its port is the suburb of Bulak.

Not the least valuable of Egypt's assets, normally, is the tourist traffic, though currency restrictions have hampered it since the Second World War. The Nile plays an important part in this traffic, and commercially also it is not a negligible factor, though it presents

¹ The Egyptian £ is linked with sterling and is valued at £1 0s. 6½d.

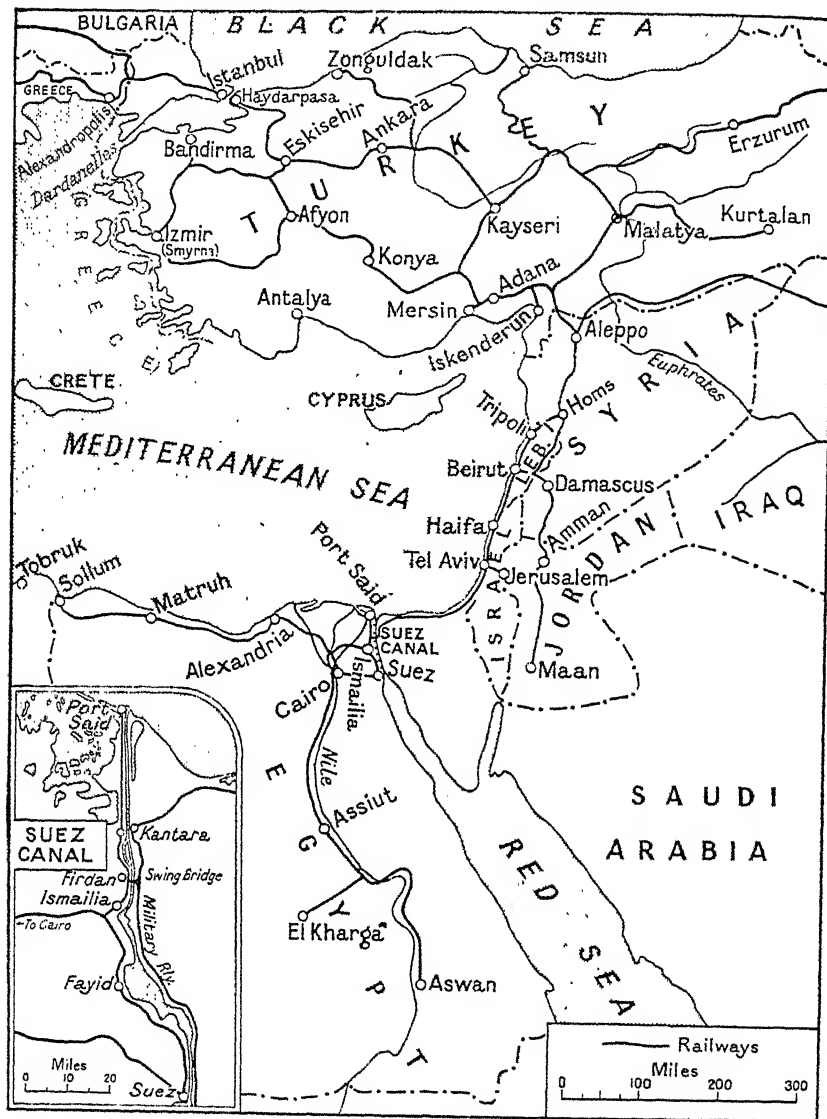
difficulties for navigation. Shallow-draught vessels are able to ply on it as far up as the Aswan dam, where a lock allows the ascent to Shellal, whence navigation can proceed as far as Wadi Halfa, on the Sudan border. Several canals assist navigation from the Cairo district to the sea; the chief (the Mahmudia Canal) connects the western arm of the delta with the port of Alexandria; another connects Zagazig, on the eastern side of the delta, with the Suez Canal. Over 4,000 miles of state railways and nearly 900 miles of private lines serve the 13,000 square miles of inhabited land. The state railways are nearly all of standard-gauge (4 ft. 8½ ins.), but the line to the Western Oases and the privately owned lines—over 1,000 miles altogether—are on the 2 ft. 6 in. gauge. These narrow-gauge lines are mainly in the agricultural districts of the delta, where they are more conveniently employed than tracks of greater width; they act as feeders to the standard-gauge system. Trunk lines of the state railways connect the ports of Alexandria, Port Said, Ismailia and Suez with Cairo, and Cairo with Shellal (Aswan). Railway traffic is carried across the Suez Canal on a swing bridge built during the Second World War by the British Army, a few miles south of Kantara. It is now possible to travel by rail continuously from Haidar Pasha, on the Bosphorus, opposite to Istanbul, into and across Egypt to the little seaport of Sollum, on the Libyan border, though the strained relations between the Arab States and Israel prevent an actual through service.

Cairo is an airport of major world importance; it is the junction of British air lines to India and South Africa, has Dutch connections to Holland and the East Indies, and local services to Alexandria, Aswan, and Israel. The Egyptian Government has built a marine airport on Lake Mariut, near the centre of Alexandria.

The Suez Canal

Including approach channels to the terminal harbours, the Suez Canal is 103 miles long. From time to time since it was opened in 1869 it has been widened and deepened till now (1953) it has a minimum depth of 40 ft., the permitted maximum draught for ships passing through it being 34 ft. The general width is 400–500 ft., and the minimum at the standard navigable depth is 197 ft. Passages may be made both day and night.

By agreement between the Canal Company and the Egyptian Government in 1949, further improvements, scheduled for completion in 1954, are now being carried out, including (1) the deepening of the Canal to permit of the passage of vessels drawing up to 36 ft., and (2) the cutting of a by-pass 7½ miles long to facilitate transit in both directions. It has also been agreed that on the expiry in 1968 of the 99-year concession for the Canal, the entire property will pass into the possession of the Egyptian Government.



EGYPT IN RELATION TO OTHER COUNTRIES AT THE EASTERN END OF THE MEDITERRANEAN, WITH INSET MAP OF THE SUEZ CANAL

The percentage of the net tonnage passing through the Canal made up by British shipping was, in 1900, 57·6; in 1920, 64·0; in 1938, 50·4; in 1952, 33·3. The following table shows the general growth and fluctuations of the traffic since 1869.

NET TONNAGE IN THOUSANDS OF TONS (000 OMITTED)

Year.	No. of Vessels.	Tonnage.	Year.	No. of Vessels.	Tonnage.	Year.	No. of Vessels.	Tonnage.
1869	10	6·6	1897	2,986	7,899	1925	5,337	26,762
1870	486	437	1898	3,503	9,239	1926	4,980	26,060
1871	756	761	1899	3,607	9,896	1927	5,543	28,965
1872	1,082	1,161	1900	3,441	9,738	1928	6,081	31,906
1873	1,173	1,368	1901	3,699	10,824	1929	6,274	33,466
1874	1,264	1,632	1902	3,708	11,248	1930	5,761	31,669
1875	1,494	2,010	1903	3,761	11,907	1931	5,332	30,031
1876	1,457	2,097	1904	4,237	13,402	1932	5,029	28,354
1877	1,663	2,355	1905	4,116	13,134	1933	5,416	30,674
1878	1,593	2,270	1906	3,975	13,446	1934	5,651	31,736
1879	1,477	2,263	1907	4,267	14,728	1935	5,992	32,811
1880	2,026	3,057	1908	3,797	13,640	1936	5,877	32,379
1881	2,727	4,137	1909	4,241	15,418	1937	6,635	36,491
1882	3,198	5,057	1910	4,538	16,575	1938	6,171	34,418
1883	3,307	5,776	1911	4,969	18,327	1939	5,277	29,573
1884	3,284	5,872	1912	5,372	16,672	1940	2,589	13,536
1885	3,624	6,336	1913	5,085	20,034	1941	1,804	8,263
1886	3,100	5,768	1914	—	—	1942	1,646	7,028
1887	3,137	5,903	1915	3,708	15,266	1943	2,262	11,274
1888	3,440	6,641	1916	3,110	12,325	1944	3,320	18,125
1889	3,425	6,783	1917	2,353	8,369	1945	4,206	25,065
1890	3,389	6,890	1918	2,522	9,252	1946	5,057	32,732
1891	4,207	8,699	1919	3,986	16,014	1947	5,972	36,577
1892	3,559	7,712	1920	4,009	17,575	1948	8,686	55,081
1893	3,341	7,659	1921	3,976	18,260	1949	10,420	68,862
1894	3,352	8,039	1922	4,347	20,861	1950	11,751	81,796
1895	3,434	8,448	1923	4,621	22,873	1951	11,694	80,336
1896	3,409	8,560	1924	5,122	25,261	1952	12,168	86,137

POPULATION OF PRINCIPAL TOWNS AT 1947 CENSUS

Cairo	2,100,506	Mehalla el Kubra	115,509
Alexandria	925,081	Suez	108,250
Port Said	178,432	Mansûra	102,709
Tanta	139,965	Assiut	90,378

SUDAN

After its reconquest in 1896-99 from the Mahdists, who for sixteen years had held tyrannical sway over it, the area lying between Egypt and Uganda was given the status of a condominium, or joint dominion of England and Egypt. Known as the Anglo-Egyptian Sudan, or simply 'the Sudan', it has been administered under the Anglo-Egyptian Convention of 1899, by a Governor-General appointed by Egypt with the assent of Britain. Its status as a condominium was reaffirmed in the Anglo-Egyptian Treaty of 1936, but the Convention and Treaty were abrogated by Egypt in 1951 and the King of Egypt was declared to be also King of the Sudan. The British Government refused to recognise this unilateral abrogation

of the existing arrangements, and, in pursuit of its policy of establishing self-government in the Sudan, which had already an elected Legislative Assembly, a draft constitution was drawn up and is now (1953), after discussion and new elections, about to be adopted.

The Sudan covers an area of just under a million square miles, and its latitudinal extent—from 22°N. to 4°N.—covers the transition from lands of summer rainfall in the south to the absolute desert of the north. The population is about 6½ m., falling into two main divisions—the Arab peoples of the northern provinces, with their distinctive civilisation, and the primitive tribes of the upper Nile. Throughout the territory the Nile valley is the main artery of trade and seat of population; but there are numerous nomadic or semi-nomadic tribes in the highlands of Darfur and the Libyan desert on the west, and in the Abyssinian foothills and the Nubian desert on the east and north-east. In the extreme north-east the territory extends to the Red Sea, which it borders for some 500 miles, forming the central section of the western shore.

To the south of the Egyptian desert, the amount of summer rainfall—much of it thunderstorms—increases steadily; thus Khartoum, in latitude 16°N., has 5 inches annually, nearly all in July and August; at Lake No, in latitude 10°N., the total is about 30 inches, and at Mongalla, in latitude 5°N., it is nearly 40 inches, mainly falling between April and October. The seasonal character of the rainfall is responsible for the annual flooding of large areas in the south, where the topography of the vast basin of the Bahr-el-Jebel, or Albert Nile, which lies at an elevation of between 1,200 ft. and 1,500 ft. above sea-level, is extremely flat. These annual floods result in much loss of water by evaporation. On its way north the Bahr-el-Jebel is joined at the great swamp of Lake No by the Bahr-el-Ghazal, its only considerable affluent from the highlands of Darfur, and shortly afterwards by the Sobat, which collects the drainage of the Abyssinian foothills. Beyond Lake No, as far as Khartoum, the main stream is known as the White Nile; it receives little or no water from tributaries on either side except the two great streams from the Abyssinian mountains, the Blue Nile and—below Khartoum—the Atbara, which are responsible for the annual flooding of the Egyptian Nile (p. 632).

The natural vegetation of the Bahr-el-Jebel basin is savanna, or tropical grassland; trees are found along the water-courses only, lack of perennial water and the natural annual firing of the grass preventing much tree growth elsewhere. The streams themselves frequently flow through swamps, where papyrus, bulrushes, and floating weeds grow in abundance. During the flood season much of this vegetation becomes detached and floats, blocking up the water channels, causing further flooding, and hindering navigation. This floating vegetation is called 'sudd'. The main stream of the Bahr-

el-Jebel is regularly patrolled to preserve its navigability; it is navigable by stern-wheel steamers of shallow draught from Lake Albert to Nimule on the northern frontier of Uganda, and again, after a long stretch of rapids, from Rejaf, just south of latitude 5°N. On the Sobat and Bahr-el-Ghazal navigation is practicable only in summer, on the former to the Abyssinian town of Gambela, and on the latter to Wau. The savanna becomes drier towards the north, and the ground is almost bare except during and just after the rains. Acacias are the principal trees.

The southern portion of the Sudan is inhabited mainly by primitive peoples, such as the Nuer and Dinka tribes, who support life by rearing cattle, fishing, hunting the hippopotamus, and growing crops of millet or maize after the summer rains. Some cotton and coffee are also produced. Over the remainder of the territory the products are mainly vegetable. Little mineral wealth has been exploited, or indeed discovered. Some salt is obtained on the Red Sea coast, and a little gold at Gebeit, in the Red Sea hills. Gum-arabic is the most valuable collected product, the Sudan being the world's principal source of this substance; in 1951 over 41,000 tons were exported, valued at nearly £E3½m. The finest quality gum is derived from the tree *Acacia vereke*, but the *Acacia arabica* is also exploited. Most of the gum comes from the central part of the territory, in the province of Kordofan. Of the cultivated crops, those used chiefly for food are the *dura* variety of millet, and dates; the latter are obtained mainly from the more desert regions of the north, the former is cultivated in almost every settlement, both with and without irrigation. Sesamum and groundnuts are also grown.

Economically the most important crop is cotton, which in 1950, an exceptionally good crop year, was grown on over ½m. acres and produced nearly 100,000 tons of lint. In the following year 95,000 tons valued at £E47m. were exported, as well as 117,000 tons of cotton seed valued at £E4m.; these two providing five-sixths of the total value of the exports (£E61m.). Some American cotton is now being grown without the aid of irrigation, utilising the summer rains, in the Nuba Mountains region of Kordofan province and in the Bahr-el-Jebel region; and some is also grown near the Nile where irrigation water is available from pumping-stations in the north. Of the ½m. acres planted with cotton, however, the greater part produces irrigated Egyptian 'sakel' cotton. This was first cultivated in the north-east, on the Gash and Baraka rivers, around Kassala and Tokar, but since irrigation water has been available in the Gezira (the plain occupying the angle between the White and Blue Niles south of Khartoum), the latter area has become predominant. It is remarkably level, with a gentle slope to the west and north-west, an ideal irrigable tract. A mighty dam at Sennar, on the Blue Nile, was completed in 1925, and almost at once a quarter of a million acres of

hitherto semi-arid land were brought under cultivation; further canal construction has increased the area of the Gezira Scheme to about a million acres, of which over 200,000 acres are under cotton.

As in Egypt, livestock are everywhere important. Forage crops grown in the irrigated areas provide fodder for cattle, whilst cattle reared on the natural grasses represent the chief source of wealth for the semi-nomadic peoples of the south. The total number of cattle is estimated at over 5m. Sheep (6m.), goats (5m.), and camels (2m.) are also reared, for milk, meat, wool, or hair, or as beasts of burden. Camel-caravan routes running across the Libyan and Nubian deserts to the Red Sea are now almost supplanted by railway and motor roads; and the old market centres of El Fasher in Darfur, Berber on the Nile, and Suakin on the Red Sea coast have lost much of their former importance.

Over 2,000 miles of railway (3 ft. 6 in. gauge) and some 2,400 miles of river-steamer routes carry most of the trade of the Sudan. As in Egypt, rail must supplement river transport because of the impediments to continuous navigation provided by the cataracts where the river Nile flows over the edges of the crystalline rocks of Nubia. The main line of railway runs from Wadi Halfa (see p. 639) across the great Dongola bend of the Nile to Abu Hamed, follows the river up to Atbara and Khartoum, and then goes up the Blue Nile to Sennar. From Atbara a line goes east to Port Sudan and Suakin on the Red Sea. At Sennar the line forks: one branch goes west, crossing the Nile at Kosti, to the Kordofan market centre of El Obeid; the other east and north through country bordering on Abyssinia and Eritrea, along the Nile-Red Sea watershed, to link up with the Port Sudan line.

The White Nile—using the name in its loose sense—is navigable nearly to the Uganda frontier, and the Blue Nile in summer up to Roseires. Road communication in the south, where the seasonal rains render maintenance difficult, is in its infancy, but all-season roads are available across the southern frontier into Uganda and the Belgian Congo; there is still, however, no permanent road linking northern and southern Sudan, the river and, more recently, the aeroplane providing the only routes. Khartoum is a regular landing-ground on the air service from London to Nairobi, and Wadi Halfa, Malakal, and Juba are landing-grounds for local services.

Khartoum, which was captured from the Mahdists, together with the large village of Omdurman, in 1898, has been rebuilt as a European city and is the administrative centre. It lies at the junction of the Blue and White Niles, in the angle between them; it has about 75,000 inhabitants, and has derived much importance from its focal position and from the development of cotton and other crops in the Gezira. Khartoum North, on the far side of the Blue Nile, has a population of about 35,000 and Omdurman, on the far side of the

White Nile, about 125,000. Omdurman is essentially an overgrown African market centre, but with the continued increase of population it is beginning to develop civic character, with broad thoroughfares and a boulevard stretching for miles along the river front.

More than 80 per cent. of the foreign trade passes through Port Sudan (50,000), an artificial port constructed in 1906, when the railway reached the coast, to replace the old Arab harbour of Suakin, which was unable to accommodate large vessels. It has increased rapidly, and is a regular port of call for liners bound from Europe to East Africa, India, and the Far East. A large part of its export trade is in cotton. Other exports are gum, sesamum, skins, gold, and groundnuts. The exports go mainly to Great Britain, Egypt, and India and Pakistan; the imports come largely from the same four countries. Total imports into the Sudan in 1951 were valued at £E42m., the main items being cotton piece-goods (£E7½m.), machinery and transport equipment (£E4½m.), sugar (£E3¾m.), metals and metalware (£E3m.), petroleum products (£E2m.). Other imports to the value of between one and two million pounds each were coffee, tea, jute sacks, and artificial textiles. It is noteworthy that exports (p. 643) exceeded imports in value by nearly 50 per cent.

THE EASTERN HORN

The 'Eastern Horn' of Africa includes Abyssinia and the adjoining Red Sea and Indian Ocean coastlands of Eritrea and Somaliland.

ABYSSINIA, or **ETHIOPIA** as it is officially styled, is an independent sovereign state, organised on feudal lines. It has an ancient civilisation with a barbaric background, which a progressive emperor is trying to modernise. It was conquered and occupied by Italy in 1936, but was restored to independence by the British in the Second World War, with an Italian legacy of improved road communications. By resolution of the United Nations the adjoining territory of Eritrea (formerly an Italian Colony; under temporary British Military Administration during and after the Second World War) was federated with Abyssinia on the basis of autonomy in local affairs, effective in September 1952 (see separate notice below). The combined area is about 400,000 square miles (slightly larger than all Egypt) and the population (nearly all in Abyssinia) about half that of Egypt. The new arrangement is important to Abyssinia as giving her access to the sea, from which she was formerly cut off.

Abyssinia proper (350,000 square miles) is a land of high mountains and plateaus, and the population, officially estimated at 15m. (probably not more than 10m.), is mostly resident above 5,000

ft. Addis Ababa, the capital (300,000), lies above 8,000 ft., and there are peaks rising to 14,000 ft. Lake Tsana (6,000 ft.) is the source of the Blue Nile. A single-track metre-gauge French railway, 486 miles long, connects the French port of Djibuti with Addis Ababa, which is also reached by air from Cairo. Some forests, where coffee grows wild, occur at lower levels; much of the land between 6,000 and 9,000 ft. can be used for cultivation and pasture, producing cereals and fruits of Mediterranean type, whilst between 9,000 and 13,000 ft. there are vast areas of open pastures where cattle and sheep are numbered by the million; the official estimates are 18m. and 17m. respectively. Gold and platinum are among the minerals which are worked. Exports, mainly coffee and hides and skins, were valued in 1950-51 at close on £16m., of which coffee accounts for half. Cotton goods and salt figure largely in the imports, which were valued in the same year at £13.6m.

Eritrea, now linked with Abyssinia in a federation which attaches it to the Ethiopian Crown but allows it local autonomy, is nearly as large as England, with a semi-nomadic population of little more than a million. It comprises a narrow coastal strip, extending for more than five hundred miles along the Red Sea from the Strait of Bab-el-Mandeb northward, backed by an escarpment rising some 8,000 ft. to a plateau which falls away again to the west. Both the winter rains of the tropical lowlands and the summer rains of the temperate plateau are scanty and uncertain, and cultivation on a commercial scale calls for irrigation. A narrow-gauge railway (95 cm.; about 3 ft. 1½ ins.) runs from the chief port, Massawa (population 27,000), up the escarpment to the capital, Asmara (117,000), an Italianised city where most of the Italian colonists who remain are to be found, and thence continues over the plateau to Agordat, a total distance of about 190 miles from Massawa. Roads are first class, and Asmara has regular air services to and from neighbouring countries. The small population is divided mainly between Moslems and Christians (Copts). Pearl fishing is practised along the coast, and there is a big production of salt from saltpans at Massawa (70,000 tons in 1950) and Assab, the second port. Some cotton and millet are grown, under irrigation, in the coastal strip, but the main wealth of the African population is in their flocks and herds—over a million cattle and nearly a million sheep. Hides and skins are exported, and the products of a few secondary industries at Asmara.

FRENCH SOMALILAND, situated on the coast between Eritrea and British Somaliland, and backed by Abyssinia, occupies a commanding position immediately south of the entrance to the Red Sea. It is the smallest of the Somaliland territories, with an area of 9,000 square miles (a fifth larger than Wales) and a population at the 1951 census of only 56,000. Nearly a third of these are

resident in Djibuti, the capital and port of the territory, terminus of the metre-gauge railway 486 miles long connecting with Addis Ababa, the Abyssinian capital. This railway, which carries much of the external trade of Abyssinia, is French Somaliland's chief claim to economic importance.

BRITISH SOMALILAND, lying along the northern coast of the Horn of Africa, and looking cross the Gulf of Aden to Aden Colony and Protectorate, is itself a British protectorate, with an area of 68,000 square miles—a third as large again as England, but with a population of under a million. Like the other territories in this corner of Africa, it is largely desert and occupied by nomad tribes whose wealth is in their flocks and herds—chiefly sheep and goats (4-5m.) and camels (2m.). Among vegetable products are frankincense and myrrh. A coastal plain is backed by plateaus rising to 7,000 ft. and reaching back to Abyssinia. Berbera, the chief port, has a population varying with the season from 15,000 to 30,000. The capital Hargeisa (15,000 to 20,000), lies among the uplands. Exports (mainly meat, hides and skins, and ghee) were valued in 1950 at £692,000, and imports at £1,217,000. There is no railway.

SOMALIA, formerly Italian Somaliland, fronting the Indian Ocean, was occupied by British Forces during the Second World War and remained under British administration till 1950, when it was restored to Italy by the United Nations as a Trustee Territory for ten years, with a view to its development in that time to the status of an independent sovereign state. It has an area of 190,000 square miles (two-thirds larger than Italy) and an estimated population at the end of 1950 of 1½m. It is largely desert or semi-desert, ranged by pastoral tribes owning large numbers of sheep (2m.), goats (2m.), cattle (1½m.), and camels (1½m.). The two main water-courses, the Juba and the Webi`Shebeli, are in the south, and here, where Kenya ceded an area of 33,000 square miles to its northern neighbour in 1926, are extensive Italian plantations yielding commercial crops of cotton, sugar cane, and bananas. Somalia had 10,000 acres under bananas in 1950, with a production of 34,000 tons, and in the season there is a fortnightly service of banana ships from the small port of Kismayu (5,000), near the mouth of the Juba river, to Genoa. The capital and chief port is Mogadiscio, with an estimated population of 65,000. Exports, in which hides and skins play a large part, were valued at £880,000 in 1949, and imports at £1,380,000.

LIBYA

The vast area lying between Egypt and the French territories of north-west Africa was the former Turkish province of Tripoli. It was seized by Italy in 1912 and lost by her in the Second World War. It contains three provinces, of which Cyrenaica in the east, bordering Egypt, and Tripolitania in the north-west, bordering Tunisia, came temporarily under British administration, while the third, Fezzan, in the south-west, bordering Algeria, was administered by France, pending decision by the United Nations on the future of Libya. In accordance with the decision finally reached, Libya was constituted, in December 1951, an independent sovereign kingdom, combining the three provinces on a federal basis, with the Amir of Cyrenaica as hereditary monarch of the whole (King of Libya), an elected Parliament of two Chambers for the whole, and a Governor for each province assisted by an executive council and a legislative council. The total area is estimated at 680,000 square miles (double the size of France and Italy combined), and the total population (1951) at 1,150,000, of which Tripolitania has nearly 800,000, Cyrenaica over 300,000, and the Fezzan about 50,000. Tripoli and Benghazi (Cyrenaica) are joint capitals, Tripoli functioning in that capacity in winter, and Benghazi in summer.

Much of the country is rock or sand, desert or semi-desert, and southwards it merges into the Sahara; but the desert is interspersed with many extensive oases—Jārabub, Jalo, Kufra, Jofra, Murzuk, Ghadames, Ghat, &c. In the coastal zone also are some of the richest oases in North Africa, yielding good crops of dates, oranges, olives, and other Mediterranean products. These are varied by steppe country suitable both for growing cereals and for raising livestock. Italian colonisation was especially active in the coastal region round Tripoli and on the slopes of the Barka plateau in Cyrenaica. Salt is obtained along the seashore, and sponge and tunny fisheries are carried on along the coast; but in general the coast is rather dangerous because of sandbanks. On land the chief agricultural products, next to 'Mediterranean' fruits, are barley, wheat, and tobacco. The drier parts behind the coast provide esparto grass. Sheep and goats yield wool and leather for local domestic industries.

Comprehensive returns of actual production and international trade must await the development of the new state. Available figures

are mostly incomplete (usually for Tripolitania alone) and relate to different years. It is estimated that in all Libya there are some 3m. date palms with an annual production of perhaps 50,000 tons; 80 per cent. of the trees are in Tripolitania and Fezzan. Barley is easily the biggest cereal crop, grown in Tripolitania in 1949 on over 600,000 acres yielding 80,000 tons. The olive crop in Tripolitania in 1950 was estimated at 20,000 tons, and the production of olive oil in that province at 4,000 tons. In Tripolitania and Cyrenaica together there are about 1½m. sheep and goats, 60–70,000 cattle, and 80,000 camels.

Several short railway lines radiate from Tripoli (estimated population 150,000) and Benghazi (60,000). Towards the eastern end of the coast a short line from Tobruk (4,000) to Sollum, just over the Egyptian border, is no longer working; but from Sollum there is rail connection with Cairo. A motor road, with branches, traverses the entire length of the coastal zone, and a twice-weekly bus service connects Tripoli and Benghazi, passing through Homs (56,000) and Misurata (63,000).

THE ATLAS LANDS

The Atlas Lands of western North Africa, so called from their chief physical feature, the Atlas mountains, are European rather than African in their structure and climate, Asiatic rather than African in their native population. They are known to the Arabs as 'Jesirat-el-Maghreb'—the Island in the West; an expression justified by the existence of a large habitable area surrounded on the one side by the Mediterranean Sea and on the other by the Sahara Desert. This area constitutes a geographical region about as large as the British Isles and France added together, with considerable variety of topography and agricultural possibilities. The unity which the Atlas Lands possess to-day is the result of the unity of French political control over all but a small portion of the region. During the past two thousand years one empire after another has conquered the area and left its mark: Carthage, Rome, the Vandals, the Byzantines, the Arabs, and the Turks. French influence dates from 1830. Algeria was proclaimed a French colony in 1834, but several decades elapsed before economic progress began; Tunisia accepted French protection in 1881, and after a long period of warfare the Sultan of Morocco did likewise in 1912. The varying length of the period of French influence, and the varying proportion of African to European population, result in distinct differences of development. Algeria, sometimes called "France in Africa", has been developed and colonised largely with a view to increasing France's material wealth and food supply; in Tunis the native population has a longer history

of economic progress, and the European population is both French and Italian; the modern development of Morocco dates mainly from the First World War.

ALGERIA. Parallel chains of the Great and Little Atlas cross northern Algeria from south-west to north-east, coming from Morocco and extending into Tunisia. In Algeria the region best fitted for cultivation is a strip of lowland or land at moderate elevation between the coast and the Little Atlas, a strip known as the Tell. The region between the Great and the Little Atlas is a plateau producing little besides alfa (esparto). South of the Atlas is the Biled-ul-jerid, or Land of Dates. In its full extent Algeria embraces a vast tract of the Sahara—not all level sandy wastes, but broken by extensive uplands, notably the great mountain mass of Ahaggar, rising to between 6,000 and 7,000 ft. This Saharan territory forms by far the greater part of the country. Algeria has a total area of 850,000 square miles and a population of over 8½m. It is divided into North Algeria, comprising three departments (Algiers, Oran and Constantine) with full French status, and Southern Algeria, composed of territories. The areas and the populations of the two divisions are in inverse ratio; Northern Algeria occupies less than a tenth of the total area and supports more than nine-tenths of the total population. It is this region, rather smaller than Great Britain, from which Algeria derives most of its economic and commercial importance.

About a tenth of the population is French; the great majority are Kabyles (Berbers) and Arabs. Since the French occupation over a hundred years ago, French communities have been established in many places, sometimes on land confiscated from rebellious Berbers and Arabs. The modern development of the country is largely due to French industry and enterprise, supported by government expenditure on public works. Roads and railways have been built, harbours constructed, new lands brought under cultivation by the sinking of artesian wells. Northern Algeria has good natural resources. There are extensive fisheries, and considerable mineral wealth, chiefly represented, in the present mining output, by iron ore (2½m. tons in 1950) and phosphates (between half and three-quarters of a million tons). Large areas are occupied by woodlands, often of secondary growth, but including some fine forests, among which the cork-oak is the chief commercial factor. These are all valuable resources, but the predominant interests of Algeria are agricultural and pastoral industry and the processing of the resultant products.

Climate and crops are similar to those of southern Italy and southern Spain. The principal cereals grown are wheat and barley—the production of wheat approaching 1m. tons from 4m. acres, and of barley 900,000 tons from 3m. acres. In 1950, oats produced 140,000 tons from under ½m. acres, and potatoes, a heavy-yielding crop,

220,000 tons from 50,000 acres. Among Mediterranean fruits, grapes are outstanding; grown chiefly for wine, crops approach 2m. tons from under 1m. acres. The orange crop approaches $\frac{3}{4}$ m. tons, and the production of dates is estimated at 100,000 tons. About 20,000 tons of tobacco are also grown annually. Sheep are pre-eminent among livestock. In 1949–50 they numbered 4 $\frac{1}{2}$ m., and goats nearly 3m. Cattle were estimated at over $\frac{3}{4}$ m., and camels at 140,000.

Communications are served by 22,000 miles of national, departmental, and main roads, and over 18,000 miles of by-roads and desert routes. Nearly 3,000 miles of railway link the principal centres of population in Northern Algeria and connect with the railway systems of Morocco and Tunisia, as well as sending out long tentacles southwards into the fringes of the Sahara—as far as Touggourt on the east and Figuig and Colomb Bechar on the west.

Trade is mainly in the products already mentioned, as regards exports, while imports cover a wide range of commodities needed to supplement local resources and promote development. Since 1938 franc values have rocketed with the increasing cost of most things, coupled with currency depreciation. In 1950, both imports and exports were valued in francs by the 100,000m.: frs.152,000m. in the case of imports (nominally 30 times the pre-war value), and frs.113,000m. in the case of exports (20 times the pre-war value). The comparison with the pre-war figures is no criterion of real growth of trade; but it is significant that whereas in 1938 exports exceeded imports in value by one-eighth, in 1950 the position was reversed—imports exceeded exports in value by one-third. In terms of sterling, converted at the respective rates of exchange, the 1950 figures (imports £155m., exports £115m.) are only from 3 to 5 times the figures for 1938, and having regard to sterling's own depreciation in the interval and the natural increase of prices, it would seem that trade in 1950 was not so markedly different from its pre-war volume. This is borne out by a quantitative study of the trade returns, in which wine provides a particularly striking example of the danger of judging the post-war development of trade by values only. Up to 1950 the post-war exports of wine had not regained the 1938 measure of quantity (16m. hectolitres), and in 1950, though more than in either 1948 or 1949, the quantity was only 75 per cent. of the 1938 figure. But wine regularly constitutes about half the value of the exports, and in 1950 the smaller quantity exported was 19 times the value of the wine exports in 1938. Vegetable and animal products accounted for another 25–30 per cent. of the exports by value in 1950 and while some of these fluctuate considerably with the season, several have shown a tendency to increase in quantity in post-war years, notably dates and citrus fruit, and preparations of meat, fish, and vegetables. Raw and processed cork has not varied greatly, nor the output of tobacco. Fertilisers are only a small fraction of the

quantity exported in 1938, but phosphates excluding fertilisers have increased from 500,000 to 600,000 tons, while exports of iron ore have increased eight or nine-fold, amounting in 1950 to nearly 2½m. tons and providing 4 per cent. of the value.

Of the imports in 1950, foodstuffs accounted for 20 per cent. of the total value, half the amount being represented by sugar and coffee. Machinery and transport equipment were responsible for another 25 per cent. of the value, and woollen, cotton, and other fabrics for over 10 per cent. Imports of kerosene in 1950, compared with 1938, had multiplied four-fold in quantity and nearly forty-fold in value, and the quantities imported of motor spirit, gas oil and fuel oil were also much larger; but coal was down by a third—under 400,000 tons as against nearly 600,000 tons—though its value was increased fifteen-fold.

France supplies three-fourths of the imports by value and takes three-fourths of the exports. Including French dependencies her share of the total is over 80 per cent. Of the balance, the United Kingdom takes most of the exports, followed by Germany; and the United States supplies most of the imports. Exports to the United Kingdom are chiefly iron ore (which is all but free from phosphorus) and esparto grass (for paper-making). According to the United Kingdom trade returns, U.K. imports of iron ore from Algeria in 1952 amounted to nearly 1½m. tons valued at over £10½m., and imports of esparto to 95,000 tons (much less than usual), valued at nearly £4½m. Imports of Algerian phosphates were valued at under £½m.

The principal Algerian ports are Algiers (the capital), Oran, Mostaganem, Bône, Philippeville (the port of Constantine), and Bougie. The populations of these and other towns with over 50,000 inhabitants at the 1948 census are shown below.

POPULATION OF PRINCIPAL TOWNS (MUNICIPAL AREAS) AT CENSUS OF 1948

Algiers	416,758	Tlemcen	85,345
Oran	362,295	Sidi-Bel-Abbès . .	78,679
Constantine . .	159,541	Mascara	57,500
Mostaganem . .	99,490	Philippeville . .	53,242
Bône	94,021	Bougie	52,283

TUNISIA. Though parts of a geographical whole, Morocco, Algeria and Tunisia differ in some notable respects physically as well as politically. The Great and Little Atlas extend from Algeria across northern Tunisia, but the chief area of cultivation in the protectorate is not, as in the colony, between the coast and the Little Atlas, but between the two chains of the Atlas, where the Algerian intermediate plateau drops to the valley of the Mejerda, a river which rises on the plateau and in its lower course regularly overflows its banks during the winter rains, irrigating and fertilising the neighbouring plains. South of the Atlas a string of shallow salt lakes

(*shotts*) extend from near the Gulf of Gabes inland for some 250 miles, reaching beyond the Tunisian frontier into Algeria and obstructing the passage of caravans trading between the fertile north and the desert south. These *shotts* lie below sea level, and a project was advanced to convert them into an arm of the sea, but was abandoned as uneconomic. It is estimated that there are over 3m. date palms in the southern oases, and over 22m. olive trees in the Sahel, as the south-east littoral is called.

In spite of differences, Tunisia is essentially a small edition, economically and commercially, of Northern Algeria. It is little more than half the size, with an area of 48,000 square miles (rather smaller than England) and its population (about 3½m., including 150,000 French and 90,000 Italians) is less than half that of its neighbour. But it has much the same climatic conditions and resources. Sheep (estimated at 2.4m. in 1949-50) and goats (1.3m.) are the most numerous livestock. There are over a ½m. cattle, and as many camels as in Algeria (140,000). The chief cereal crops are wheat (around ½m. tons) and barley (up to 400,000 tons). Fruit crops are abundant—170,000 tons of grapes in 1950; 30-40,000 tons of dates; 25,000 tons of oranges. Wine is not the dominating factor in the export trade that it is in Algeria, but Tunisia has the greater production of olive oil, of which the output in 1949 was over 100,000 tons, though in the following year, true to the erratic nature of the olive crop, it dropped to less than half that amount. The forests on the hill-slopes north of the Mejerda are rich in cork-oaks and another species of oak which has a valuable tanning bark. Supplies of esparto grass are also abundant, and yet another feature which Tunisia has in common with Algeria is the wealth of iron ore and phosphates, especially the latter, of which the output is double (1½m. tons) that of iron ore.

Tunisian overseas trade is about a third as valuable as its Algerian counterpart. In 1950, imports were valued at some £52m. and exports at £40 m. In that year, the United Kingdom's imports of Tunisian iron ore, phosphates and esparto were valued in the U.K. trade returns at £4½m. In 1952 they were valued at double that amount, though little more in quantity, the imports of iron ore being 558,000 tons valued at £3.4m., of phosphates 268,000 tons valued at £1.75m., and of esparto 90,000 tons (much less than usual) valued at £4.4m.

The needs of internal transport are served by 1,300 miles of railway and 5,500 miles of roads, mostly main roads, bitumenised or otherwise metalled. Air services, both internal and external, and including freight, are developing, but foreign trade is still dependent almost entirely on shipping. Most of the Tunisian ports are open roadsteads. Tunis itself, the capital and chief seat of foreign commerce, situated at the north-east corner of the protectorate, is at

the head of a shallow lagoon, but ocean-going vessels have access to the city by a channel 21 ft. deep, which is kept open through the lagoon to La Goulette, on the coast. On the north coast, France has established a naval station at Bizerta, at the mouth of another lagoon. On the east coast, Susa (Soussa), Sfax and Gabès are ports for trade with the Sahel and the interior.

POPULATION OF CHIEF TOWNS AT CENSUS OF 1946

Tunis	364,593	Kairouan	32,299
Sfax	54,637	Ferryville	29,353
Bizerta	39,327	Gabès	22,512
Soussa	36,566	Béja	22,208

MOROCCO. All over Morocco, which is nominally an absolute monarchy, the Sultan's authority is limited by agreements with European Powers which have the effect of splitting the country into several zones, falling into three main divisions. The precise confines are uncertain. As usually defined, the total area is about 170,000 square miles, and the total population 10m. Internationally, the three divisions are:

(1) **The Tangier Zone.** This is a small internationalised, neutralised, and demilitarised area round the city and port of Tangier, in the north-west tip of Morocco, at the Atlantic entrance to the Straits of Gibraltar. A representative of the Sultan administers native affairs and presides over a mixed Assembly, but a committee of the consuls-general of the controlling Powers has the right of veto. The area generally assigned to the zone is 225 square miles (about the size of the Isle of Man), with a population of 100,000, but the United Nations (Food and Agricultural Organisation) figure is 135 square miles (rather less than the Isle of Wight), with an estimated population in 1950 of 110,000.

(2) **Spanish Zone.** By the Spanish Zone of Morocco is usually meant the coastal strip fronting the Mediterranean, occupied mostly by the coastal range, Er Rif, and bounded on the south by a line starting on the coast south of Larache and running in a generally easterly direction to the lower course of the Muluya river, which it then follows down to the sea at the north-east corner of Morocco. The Tangier Zone is carved out of this region, which, with an area reckoned at 7,600 square miles, is roughly the size of Wales and has a population of about 1½m. Certain places along the coast, notably Ceuta and Melilla, are Spanish possessions of long standing, over which Spain exercises sovereign rights; but for the most part the zone is in the nature of a protectorate, with the Spanish administration working in co-operation with the Moorish authorities. Resources are similar to those of Algeria and Tunisia, but are less highly developed, except for the mining of iron ore, of which over 900,000 tons were produced in 1950. Practically all the ore is

exported, through Melilla, about half of it going to the United Kingdom.

Generally the area of the Spanish Zone of Morocco is recorded as about 18,000 square miles. This is really the figure for the combined areas of what are officially the Spanish Protectorate of the Northern Zone and the Spanish Protectorate of the Southern Zone. The latter (10,000 square miles; estimated population 20,000) is mostly desert country extending along the south-west coast from Wadi Dra southwards to beyond Cape Juby. It is not always remembered in connection with Morocco and might be regarded as more properly associated with the Spanish Sahara territory of the Rio de Oro, its southern continuation. Indeed, on one of the latest British maps the Dra is shown as the southern limit of Morocco. So long, however, as the area of the southern zone is combined with that of the northern zone when estimating the full extent of Spanish Morocco, it must be accounted part of the Sultan's shadowy outlying dominions. In any case, there is no question that Spanish possessions in Morocco include the little Territory of Ifni, an enclave on the south-west coast north of the Dra, over which Spain claims sovereign rights, though her effective occupation dates only from 1935. The territory has an area of 750 square miles and an estimated population of 40,000. It is largely undeveloped, and of limited economic value, but some fruit is grown.

(3) **French Zone.** This is the main body of Morocco, comprising in an unbroken expanse about 90 per cent. of the total area and nearly 90 per cent. of the population. It covers 150,000 square miles (about three-fourths the size of France) and supports more than 8½m. people. The High Atlas, whose topmost peaks rise 13-15,000 ft., run from south-west to north-east in a broad range or succession of ranges occupying most of the zone. The south-eastern flanks, exposed to the dry winds of the Sahara, are generally parched and desolate; the north-western slopes are well wooded at the lower levels. Where the mountains approach the Mediterranean they connect with the coastal range of the Spanish zone. In the angle between these ranges is a tract of uplands and lowlands stretching down to the Atlantic coast, and farther south the coast is backed by plains and uplands rising to the main range. The rivers flowing through the mountains are unnavigable, and where they cross the lower country they are apt to dry up or become much reduced in volume, except when the snows are melting on the mountains; but in many places they are well adapted for irrigation.

The Moors are strict Moslems, and until the country came under French control the Government kept largely aloof from the outside world. Foreign trade was not encouraged; there were no railways, no wheeled carts. European intervention has brought about great changes. Over a third of a million foreigners, mostly French, are

now living in the French zone—many of them in the towns but a large number on the land, where they have been settled on favourable terms and are developing agriculture by modern methods.

The natural resources of the country are much the same as in Algeria and Tunisia, though barley takes the place of wheat as the chief cereal crop, being grown on nearly 5m. acres and yielding 1-1½m. tons, against 3m. acres under wheat, yielding about ¾m. tons. Cultivation is very poor; the average return from wheat is only about 9 bushels per acre. Many other cereal and root crops are grown, but none of outstanding magnitude. The most important products, after wheat and barley, are fruits. The grape crop, grown mostly for wine, was over 100,000 tons in 1950; oranges, 130,000 tons; lemons, 20,000 tons; dates, 25,000 tons (40,000 tons in 1948). Olive crops of from 50,000 to 75,000 tons yield from 8,000 to 12,000 tons of olive oil. Flax is grown, for seed only (linseed), on very variable areas (up to 300,000 acres) with very variable production (up to 60,000 tons); and in 1950 the crop of sunflower seed, which has been on the increase, amounted to 10,000 tons. But the big feature of the farming industry in French Morocco is the number of its livestock, which far exceed those of its neighbours. At the close of the half century, cattle numbered 2m., sheep over 10m., goats over 7m., camels nearly 200,000, and horses, asses and mules over 1m.—two-thirds of them asses, while horses and mules were fairly evenly divided. There are extensive forests, especially of cork trees, which alone cover over a thousand square miles. French fishermen have played an active part in developing the fishing industry (tunny, sardines, lobster, &c.).

Minerals include iron ore, which has not, however, been exploited to so large an extent as in Algeria or even in Spanish Morocco; production in the French zone in 1950 was little over 300,000 tons. As in Tunisia, production of phosphate rock is on a much bigger scale, amounting in 1950 to over 3·8m. tons. There are extensive deposits about 50 miles inland from Safi, a progressive little port about midway between Casablanca and Agadir. The mines are connected by rail (standard gauge) both with Safi (which is also a centre of the sardine fishery) and with Casablanca, and at both these ports there are special facilities for exporting the phosphates. From Casablanca also a main line connects with Rabat, Meknes and Fez, and continues eastward to the important frontier town of Ujda, where it sends out a branch southwards across the Great Atlas into the fringes of the Sahara. Beyond Ujda it links on, at the frontier, with the Algerian railway system. Altogether there are in the French zone close on a thousand miles of railway, 7,500 miles of main and secondary roads, and 22,000 miles of tracks.

The overseas trade of French Morocco is intermediate in value between that of Algeria and that of Tunisia. Exports in 1950 were

valued at roughly £66m., and imports at £116m. Foodstuffs in great variety account for nearly half the exports, the chief items being preserved fish (notably sardines), citrus fruits and (usually) barley. Minerals are responsible for over another fourth of the total, mostly calcium phosphate, but including also manganese, lead, and iron ores, and coal.

Among the imports the largest item by value is sugar, accounting for nearly one-eighth of the total in 1950, and in quantity amounting to 200,000 tons. Other foodstuffs—wheat, milk, cheese, tea, coffee—were valued at little more than half the imports of sugar, the combined percentage of the total being nearly 20. Machinery and transport equipment accounted for nearly 18 per cent, iron and steel in various forms over 6 per cent., gasoline and diesel and fuel oil 5 per cent., and fabrics (chiefly cotton fabrics) 10 per cent.

France and French dependencies supply about two-thirds of the imports and take nearly half the exports. Next to France, the best customers for the products of French Morocco were, in 1950, the United Kingdom and Germany, and the chief suppliers of imports were the United States and Cuba. In 1952 the United Kingdom imports from French Morocco included over $\frac{1}{2}$ m. tons of phosphates, valued at £3·8m., and 308,000 tons of iron ore, valued at £1·4m.

The chief towns are along the coast and between the coast and the mountains. Rabat, towards the northern end of the coast, is the official capital of the French protectorate, the seat of government under the French Resident-General and usually the Sultan's place of residence; but it has been far outstripped in size by Casablanca, a little farther south, which has developed as the leading commercial centre and port, with a population of over $\frac{1}{2}$ m., of whom about one-fourth are Europeans. Inland from Rabat are Meknes and Fez, the traditional northern capital; and inland from Mogador, which is centrally situated along the coast, is Marrakesh, the traditional southern capital, though the latter is now more easily reached by rail from Casablanca. Among ports not already noted may be mentioned Port Lyautey, formerly Kenitra, 10 miles up the Sebu river, renamed after a famous Resident-General.

POPULATIONS OF CHIEF TOWNS AS ESTIMATED IN 1949

Casablanca	569,500	Ujda	90,100
Marrakesh	239,200	Salé	58,200
Fez	202,000	Port Lyautey	57,800
Meknès	162,400	Safi	51,600
Rabat	161,600	Mazagan	40,000

SOUTH AFRICA

Though geographically it may be applied to a much larger region, the term South Africa is generally understood to refer to the Union of South Africa, one of the fully independent partners in the British Commonwealth. It was formed in 1910 by the union of the former self-governing territories of the Cape of Good Hope, Natal, the Orange Free State, and the Transvaal, which became provinces of the Union, with self-government in local affairs. Previously, development had to contend not only against the physical conditions of the country but against the troubles between the Boer and British elements in the population, culminating in the Boer war and constituting a continuing hindrance to progress till after the formation of the Union. Since the Second World War there has been a recrudescence of Afrikaner nationalism, coupled with the adoption by the Nationalist Party of the policy of *Apartheid* in relation to the native African population.

Apart from the Anglo-Egyptian Sudan, which, as a condominium, was in a class by itself, the Union has long been the largest African territory of the British Commonwealth and Empire, and, though now it is slightly exceeded in that respect by the new federation of British Central Africa, it is still easily the most important, both internationally, because of its independent status within the Commonwealth, and commercially. Its area is 472,500 square miles (five times that of the United Kingdom), and its population, at the census of 1951, 12½m. (one-fourth that of the United Kingdom). About one in five of the population is white. Cape Town is the legislative and Pretoria the administrative capital.

The adjacent territory of South-West Africa, formerly a German possession, has been administered by the Union since the First World War. Since 1949, all members of the local Assembly are elected, and the territory is represented in the Union House of Assembly by elected members. What are known as the High Commission Territories are three British dependencies, one (Basutoland) surrounded by Union territory and the other two (Swaziland and the Bechuanaland Protectorate) bordering on the Union; all three are administered by the British High Commissioner in South Africa.

All round the coast, the country rises rapidly to considerable

heights. From the western half of the south coast the ascent is made in well-marked terraces, the innermost of which form tablelands of 3,000 ft. or more in height. These tablelands are known by the Hottentot name of Karroos. The Little Karroo comes first, and beyond it the Great Karroo, which has a length of nearly three hundred miles from west to east and a width in many parts of seventy miles.

On the eastern side the rise in terraces is not so well marked, or at least not so regular. Here the main feature is the Drakensberg (Dragon Mountain) Range, really the high eastern edge of the plateau. It has the highest mountains in South Africa, rising to 12,000 ft. and descending to plateaus of over 7,000 ft. in Basutoland.

Together with the physical features just described, the circumstance of most importance in determining the character of the **climate** of South Africa is its situation between the trade-wind belts of the Indian Ocean and the South Atlantic, though a small portion in the extreme south-west receives winter rains from the westerly winds. The Karroos are subject to prolonged droughts, which cause them at times to present the appearance of hard, burnt-up deserts; but they are occupied by a vegetation singularly adapted to a climate of this nature—able, that is to say, to survive, though in a withered condition, the want of rain for months, and even years, so that in a week or two after the occurrence of rains the surface becomes green with herbs and bushes or richly coloured with multitudes of flowering plants. In such a climate cultivation, and even the rearing of livestock, are obviously precarious without irrigation, but development in this direction has made rapid strides. Technical and financial assistance is given by the State.

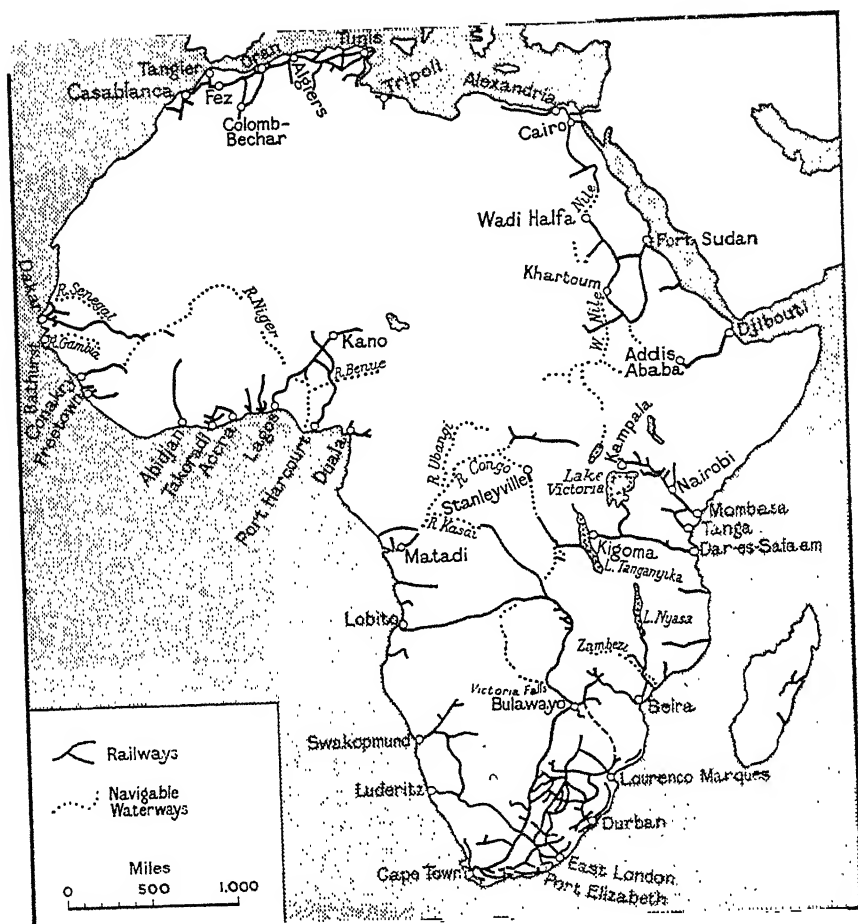
Throughout the greater part of the north-west Cape Province the annual rainfall is altogether insignificant. On a narrow strip of the south coast rains are fairly equally distributed all the year round, but the predominance of summer rains which is illustrated by the rainfall curve for Durban is the prevailing characteristic of eastern South Africa generally, owing to the fact that at that period an area of low barometric pressure in the interior greatly strengthens the trade-winds of the Indian Ocean and draws them powerfully inwards. Yet the curve for Durban, showing a high rainfall throughout the summer, is typical only for limited areas in the interior. In the greater part of South Africa, only the rains at the end of summer, culminating in February and March, fall with fair regularity and abundance. As this period of the year, in consequence of the high altitude and resulting rarity of the atmosphere, is immediately followed by a rigorous winter, those rains are useless for sowing. Only in a few parts sufficiently near the Drakensberg to get rains in August and September can wheat be grown without irrigation. Sown at the time of those rains it is reaped in December. Dry farm-

ing (see p. 64) is a partial solution. Maize and a few other crops suited to warm, rainy summers can be grown more widely.

The **rivers** of South Africa being mostly fed only by summer rains have the characteristics belonging to all tableland rivers in countries with alternating rainy and dry seasons. They flow in valleys deeply cut below the general surface of the country and having a width and slope varying with the nature of the rock in which they have been cut. In summer they are in flood, and in winter they are mostly reduced to tiny threads, which in some parts trickle between heaps of boulders filling a wide bed bordered by high bluffs. The Orange, though longer than the Rhine, is navigable for boats only a few miles up. Even the east side of South Africa is practically without navigable rivers.

So long as the development of South Africa was dependent solely on agriculture and pastoral industries the character of the climate confined the bulk of the inhabitants to the south-west and to the east. The regions first settled by Europeans lie in the south-west; the desire for further territory suitable for pastoral and agricultural development, amongst other causes, led to the great treks to the east and north. The purely British settlements of Port Elizabeth (1820) and Durban (1824) were on the south and east. In 1867 the first diamond was discovered in South Africa at Hope Town; the diamond fields of Kimberley, discovered three years later, were the cause of the first long railway line being built into the interior. A greater stimulus to railway construction was given by the discovery of the gold-fields of the Rand (Witwatersrand) in the southern Transvaal and the subsequent foundation of Johannesburg in 1886. Nearby deposits of coal, easily and cheaply mined, made it possible to work the gold-fields to advantage. Both the gold-fields and the diamond-fields attracted population. The markets which they provided stimulated, in turn, agriculture and other industries and justified expenditure on irrigation, especially for citrus fruits.

On all the **railways** into the interior the geographical features have necessitated heavy gradients, but routes have tended in that direction, partly because of the character of the coast-line. South Africa is almost entirely wanting in good natural harbours, and the points capable of being made convenient for shipping are at great distances from one another. In False Bay, east of the Cape Peninsula, there is an admirable naval station at Simon's Town, but that is not so situated as to be suitable for a commercial harbour. Cape Town is 436 nautical miles from Port Elizabeth, the latter 131 miles from East London, this again 253 miles from Durban, and Durban 300 miles from Lourenço Marques, in Portuguese territory, on Delagoa Bay; and these are the only ports at which it has been so far found worth while to provide accommodation by harbours or even long piers for the large ships of the present day, except for the small enclosed



AFRICA: PRINCIPAL RAILWAYS AND NAVIGABLE WATERWAYS

harbour at Mossel Bay. Durban (Port Natal) is the premier port in the Union. It has a fine sheltered harbour but a very narrow entrance exposed to the south-east trade-winds, and vessels usually enter only in daylight. The entrance, formerly barred, has been dredged to an average low-water depth of 42 ft. Port Elizabeth has been provided with a sheltered harbour at a cost of several million pounds. At East London the river has also been specially dredged and a turning basin created, large enough for the biggest vessels calling regularly at South African ports. Cape Town lies around a bay forming partial shelter only and relies on its fine artificial harbour. Saldanha Bay, about one degree north of Cape Town, forms an excellent natural harbour, and is linked by rail with Cape Town (133 miles). It is a South African naval training base. Phosphates are worked in the neighbourhood.

In general, both railways and harbours in the Union are state-owned. Out of 13,500 miles of railway (including lines in South-West Africa), only 174 miles are classed as private. The standard gauge is 3 ft. 6 in., and fewer than 1,000 miles of the total are of narrower gauge (2 ft.). Close on 900 miles of route have been or are being electrified to facilitate traffic on steep gradients and sharp curves. The electrified mileage is largely in Natal, where it includes the main line from Durban to the Transvaal and Orange Free State borders. Other districts which have benefited are the neighbourhood of Cape Town and the Rand, including the line between Pretoria and Johannesburg. A large proportion of the Natal railways have a gradient steeper than 1 in 35, and there are many curves of 300–350 ft. radius. The line from Durban to Johannesburg, after ascending within sixty miles to about 3,000 ft., descends nearly 1,000 ft. to Maritzburg, then in eleven miles climbs to 3,700 ft., and thirty miles farther on is at a height of 4,800 ft. The Orange Free State branch ascends by steep gradients the whole way from Ladysmith (3,284 ft.) to about 5,520 ft. in Van R  enen's Pass. On the line from Cape Town the highest altitude south of the Orange River is under 4,300 ft. The highest point on the line into the interior from Port Elizabeth is just under 5,200 ft. (near Naaupoort), and that on the East London route nearly 5,600 ft. (three miles beyond Cyphergat). On the Delagoa Bay line the great rise is within the Transvaal; Belfast is 6,460 ft. above sea-level, the line rising 5,190 ft. in the last 112 miles, and requiring a rack rail as it nears Belfast.

The table opposite shows the distances from various inland centres to the leading ports; also the times required for the rail journeys, in both directions, between Johannesburg and the several ports. It will be seen that distances and speeds are not commensurate. Nowadays, however, if speed is the main consideration, journeys are made by air services, of which there is a growing network, extending, like the railways, far beyond the confines of the Union.

<i>Inland Centres</i>	<i>Distances in Miles by Rail to Ports</i>				
	<i>Cape Town</i>	<i>Port Elizabeth</i>	<i>East London</i>	<i>Durban</i>	<i>Lourenço Marques</i>
De Aar Junction .	502	338	—	—	—
Kimberley .	649	485	507	622	702
Bloemfontein .	755	451	401	516	640
Johannesburg .	956	714	664	494	395
Pretoria .	999	739	689	519	352
<i>Time in Hours by Rail between Ports and Jo'burg</i>					
To Johannesburg .	26½	28	28½	16½	18½
From „ .	26½	25	23½	16½	16½

The following particulars of the individual provinces will exemplify in more detail both the general characteristics and the resources of the Union.

The **Cape Province** or, more correctly, the Province of the Cape of Good Hope, formerly known popularly as Cape Colony, stretches from the Atlantic to the Indian Ocean and extends northwards to the lower reaches of the Orange River in the west, beyond the Orange River to the Bechuanaland Protectorate in the centre, and to the southern borders of the Orange Free State, Basutoland, and Natal in the east. It also includes, as an integral part of the province (but administered as part of South-West Africa), an enclave of 374 square miles around Walvis Bay, the best harbour on the coast of South-West Africa and the chief port. It was formerly a whaling station, and is now a repair shop for Antarctic whaling ships.

With an area of 277,000 square miles (three times that of Britain), the province is easily the largest in the Union (over half the total area) and until the Second World War it had the most inhabitants, but the Transvaal has since held the lead. Though the population at the 1951 census (4·4m.) was more than a third of the total for the whole Union, the Cape Province is the most thinly peopled of all the provinces. As a result of the physical conditions previously described, the population is found mainly in the east, in the extreme south-west, and along a narrow strip of the south coast. Broadly, 60 per cent. are natives—Bantus, with a few Hottentots and Bushmen in the west; 20 per cent are white, mainly of Dutch, Huguenot, or British descent, with English and Afrikaans (a modified Dutch) as the principal languages; and the remaining 20 per cent. are mostly 'Coloured', with a sprinkling of immigrant Malays and others. In South Africa the term 'coloured' is used in the special sense of meaning half-castes—a mixture of European stocks with the indigenous population. Most of the Boers are pastoral farmers with holdings of from 2,000 to 6,000 acres or more. The British are mostly traders living in the towns. The proportions of British and

Boers among the white population are not definitely known but have been estimated at ± 60 per cent. Afrikaans-speaking and ± 35 –40 per cent. English-speaking, with other European nationalities about 5 per cent.

Only a small proportion of the surface is adapted for agriculture. In the western half of the province irrigation is absolutely necessary for the growing of crops, except in a small district round Cape Town, where most of the products of the Mediterranean can be grown, and whence there is a large export of the characteristic fruits of that climate. In the eastern half larger areas have a sufficient rainfall for agriculture, especially south of the Stormberg and Drakensberg, but these are mostly in the hands of African natives, who grow maize (mealies) and other grain adapted to warm rainy summers. The prevailing aridity promotes a thorny vegetation which is apt to injure the quality of the wool of the sheep reared.

The pastoral industry has from the first been of much more importance than the growing of crops. At first only cattle and native sheep were reared, the latter yielding excellent mutton but only a coarse kind of hair rather than wool. The merino sheep was introduced about 1812, and thereafter wool came to be the most important export of the colony. The present wool industry of the Union has been built up by the careful selection of rams and the breeding of pure merinos. The sheep are reared partly on grass on the coast strip, partly on the Karroos, where they depend chiefly on the deep-rooted bushes. In the arid western parts of the Great Karroo, from eight to twelve acres are required on the average for the support of a single sheep, but in the eastern parts only three. The great bulk of Cape wool is exported from Cape Town, Port Elizabeth, East London, and Mossel Bay. Uitenhage, not far from Port Elizabeth, is a great wool-washing centre. Graaff Reinet is the chief centre of the most productive pastoral area of the eastern Karroo. Besides sheep and cattle, the Angora goat has been largely reared since about 1840 and the ostrich since about 1865. Oudtshoorn, a rich irrigated district in the western part of the Little Karroo, had extensive fields of lucerne entirely devoted to the rearing of ostriches. The industry reached its zenith in 1913, when feathers were exported to the value of nearly £3m. Since the First World War, demand and exports have dwindled to relatively trifling proportions.

The diamond-fields of Kimberley have been actively worked since about 1871. The industry is controlled by a company, De Beers Consolidated Mines, Ltd., combining earlier interests and regulating both the methods and the amount of the production. Kaffir labourers are hired for terms of three months, during which they are never allowed to leave the works, where they live in enclosures known as compounds. Great expansion of the industry came when the diamonds of the surface deposits were traced to their source in

the hard rock—known to the miners as ‘blue ground’: actually a volcanic rock filling the round necks or pipes of ancient volcanoes. Working the hard rock and excavating to great depths necessitated the amalgamation of interests and the beginning of the great combines associated with such names as Cecil Rhodes, De Beer, Joel, and Oppenheimer.

Other mineral resources of the Cape Province are of little account. Coal was supplied to the Kimberley mines in their early days from Molteno, Cyphergat and Indwe (in the Stormberg region), but it was of poor quality and production has almost ceased. Copper mining flourished in Namaqualand (the arid north-west of the province) in the latter half of the nineteenth century, but the industry declined with the price of copper and by 1932 all the mines had closed down. At O’okiep, the chief centre, they have been closed and re-opened several times, the last re-opening being in 1940. The copper is exported from Port Nolloth (narrow-gauge railway connection with O’okiep).

In the parts of the province beyond the Great Kei river known as the Transkeian Territories, which include Pondoland, the white population is very scanty. Here the mouth of the St. John’s river forms an exceptionally good harbour. The want in this case is a hinterland. The Drakensberg Range prevents this harbour from being a means of access to the interior, but the Territories are capable of greater development, forming one of the best parts of South Africa—fertile, well-watered, and eminently suited for pasture.

The northern extension of the Cape Province, stretching from the middle course of the Orange River up to the Molopo, includes not only Griqualand West, with its diamond mines, but the former Crown Colony of British Bechuanaland, containing such historic centres as Kuruman, Vryburg, and Mafeking. This is not to be confused with the Bechuanaland Protectorate, north of the Molopo (see page 673).

Natal. The Province of Natal lies between the Indian Ocean and the Drakensberg, on the far side of which its neighbours are Basutoland and the Orange Free State. Coastwise it extends from the Cape Province to Portuguese East Africa, having also on its northern borders the Transvaal and Swaziland. Its area (35,000 square miles), a little larger than Ireland, is only about one-fourteenth of the Union, but it is the most densely populated province, with 2.4m. inhabitants at the 1951 census, or one-fifth of the Union total. The land rises rapidly from the coast to the interior, and the climate may be said to change from sub-tropical to temperate in the same direction. Near the coast are grown sugar-cane, cotton, tea, arrow-root, black wattle and other tropical and sub-tropical products. Natal is pre-eminent in the Union in two of these products: it is the sole seat of the sugar industry, which yields over $\frac{1}{2}$ m. tons of raw

sugar annually and not only supplies the Union but supports a valuable export trade: and it grows most of the Union's output of wattle (by far the most important of the minor forest products of South Africa), which supports a valuable export trade in wattle bark and tanning extract.

Further inland are grown the temperate cereals, and sheep and cattle are reared. Here also there is a large native population, mainly Zulu Kaffirs, who form the majority of the inhabitants. There are also 300,000 Indians; originally introduced as coolie labourers on the tea and other plantations, and as miners, many Indians have remained as market gardeners and traders. Dürban is the chief seaport and largest town. It is the nearest port in the Union to the Rand and the coalfields of Natal and the Transvaal, and, as already noted, surpasses Cape Town in the volume of its shipping and trade. Pietermaritzburg, the capital, at an altitude of 2,200 ft., is situated amid scenes of tropical beauty, but in a hollow in which the heat is oppressive. In the extreme north of the province Newcastle and Dundee rapidly increased their production of coal, which is better than that of the Cape Province, and, in spite of the long haul of 250–300 miles over a difficult railway route, is largely exported by sea and used as steam-coal by ocean liners. The annual production in Natal is about 5m. short tons (tons of 2,000 lb.)—nearly a fifth of the total production of coal in the Union, the bulk of which comes from the Transvaal.

The **Orange Free State**, situated between the Orange and Vaal rivers, has a population (1951 census) of just over a million in a country of 50,000 square miles (about the size of England); it is nearly as thinly populated as the Cape Province. The population is made up of Afrikaans-speaking farmers or 'Boers'. The surface is typical veld country, rolling grassy plains seamed by river beds. It has been called South Africa's prairie province. The plains vary from under 3,500 ft. in altitude in the west to 5,500 ft. in the east. Much of the country has a rainfall inadequate for agriculture without irrigation, but the north-eastern districts form part of the great 'maize-triangle'. They lack the August–October rains, but on the other hand have abundant rains from December to March. The remainder of the country is essentially sheep-farming land. Gold-fields with promise of a great future have been discovered around Odendaalsrust, south-west of Kroonstad, and large-scale development is in progress. Other minerals include diamonds in the south west at Jagersfontein and Koffiefontein, and coal to the north of Kroonstad and elsewhere. The capital is Bloemfontein, on the direct railway route from Port Elizabeth to Johannesburg and Pretoria.

The **Transvaal** lies to the north of the Orange Free State: that is, beyond the Vaal river—trans-Vaal. It is second to the Cape Province in extent, first in total population, and second to Natal in

density of population. With an area of 110,000 square miles—nearly double that of England and Wales—it had 4·8m. inhabitants at the census of 1951. The surface features are similar to those of the Orange Free State, but here the geological structure, even apart from the mineral wealth, is of great importance. The Transvaal may be divided into five regions: (1) The Witwatersrand—the gold-field stretching from east to west through Johannesburg. (2) The High Veld lying to the south of the Witwatersrand, composed of undulating grassy plains at an altitude of 4,700 to 5,700 ft., with very cold dry winters, but with a rainfall from January to March rendering it suitable for the cultivation, without irrigation, of maize, potatoes, and other roots, as well as of pulses, though these last are at present neglected. (3) The Bush Veld north of the Witwatersrand, and (4) the Low Veld to the north-east, in both of which the plains are generally below 3,000 ft. in height, and hence, being in a latitude below 26°S., not well adapted for European settlement. Both are traversed by comparatively high ranges of hills. Farmers migrate (trek) from the High Veld to the Low Veld on account of the dying-down of the grasses on the High Veld in the winter. (5) The South-western District, an arid and comparatively unproductive region.

The mineral wealth of the Transvaal is enormous in amount and varied in character. The first place belongs to gold, which is found in paying quantity in many parts of the country. The possibilities attracted increasing attention in the latter half of the nineteenth century. In 1872 mining was begun in the Northern Transvaal at Eersteling, since scheduled as a National Monument. Larger and more successful operations quickly followed in the Lydenburg district of the Eastern Transvaal, one of the few districts in the Union outside the Rand where gold is still mined on a considerable scale. The next decade saw a temporary boom in the De Kaap valley, where the town of Barberton sprang up in 1886. But these ventures were rendered of minor importance by the discovery, about the same time, of the gold-fields of the Rand (Witwatersrand). On the richest part of the Rand the town of Johannesburg was founded in September 1886, and at a census held in 1896 the population of the town and district was found to have grown to upwards of 100,000, of whom about half were whites. Fifty-five years later (1951 census) the total was 807,000, including 330,000 whites.

The Rand is a ridge about sixty miles long, rising about 1,000 ft. above the adjacent country. The gold-bearing rocks are a conglomerate, in which the gold occurs in the form of minute particles more or less evenly disseminated through it. Hence powerful machinery is required for its extraction, and from the first this has been a capitalist's, not a poor man's, gold-field. Labour is a perennial difficulty. After the South African War, the introduction of Chinese coolies who were kept in compounds was much criticized,

and they were gradually repatriated. African labour is now recruited in nearby colonies and protectorates, and also, by agreement with the Portuguese, in Portuguese East Africa. The total number employed is 3-400,000, in addition to 40-50,000 white employees. In 1888 the total production was 172,000 fine ounces; in 1898, the year before the South African War, 3,565,000 ounces; in 1913, before the First World War, 8,431,000 ounces; in 1938, before the Second World War, 12,161,000 ounces. In 1941 it reached a maximum of 14,386,000 ounces; in 1951 it was 11,506,000 ounces.

The Transvaal is also rich in other minerals, particularly coal and iron of medium quality, and copper, of which there are large mines at Messina, on the northern border, near the Limpopo. The production of coal is some 20m. short tons a year—over two-thirds of the Union's total output—mostly from the collieries of the Witbank district, east of Pretoria, but also from the Vereeniging mines on the northern bank of the Vaal, south of Johannesburg. Vereeniging—where the peace treaty was signed in 1902 after the South African War—is now one of the leading industrial centres in the Union. It has great steel works erected by 'Isacor' (the South African Iron and Steel Industrial Corporation), many engineering and other industrial works, and the largest steam power station in the Commonwealth, owned by South Africa's Electricity Supply Commission and operated by the Victoria Falls and Transvaal Power Company, through whom it supplies electricity to a section of the Rand. Thanks to the enterprise of the Commission in this and other ways, electric power for industrial purposes in all the large centres is unlimited and among the cheapest in the world.

Resources and Trade of the Union. Taking the Union as a whole, it is estimated that two-thirds of it is pastoral country, less than 6 per cent. arable, 3 per cent. wooded, and 24 per cent. waste or built on. According to the Food and Agricultural Organisation of the United Nations, a comparison of the two periods 1926-39 and 1939-50 shows a surprising drop in the percentage of the population actively engaged in agriculture—from 64 to 47 per cent. Small as is the percentage of arable land, it represents 17m. acres, and nearly half of this is under maize, yielding a crop of 2½m. tons. Wheat is grown on 3m. acres, but the average yield is low and the crop under ¾m. tons. Sugar-planting in Natal yields some 5m. tons of cane, from which, as already noted, over ½m. tons of raw sugar is extracted. The Cape grape crop is well over 400,000 tons; ninety per cent. of it is grown for wine, of which the output is about a ¼m. tons. The grapes are grown chiefly in the south-west of Cape Province, and exemplify the importance of geographical factors. They fall into two main categories, with differing characteristics, according as they are grown under natural rainfall in the coastal zone below the mountains or under irrigation in the Little Karroo.

Cape wines, of many types, and Cape brandy have a reputation extending far beyond their immediate locality, and a considerable trade in them has grown up not only in the Union but overseas. Fresh grapes are also a valuable export, and fresh citrus fruits, chiefly oranges, of which the production amounts to 200,000 tons. Among other noteworthy crops, as illustrating the variety of the Union's products, though on a smaller scale, are groundnuts (80,000 tons), sunflower seed (50,000 tons) and tobacco (20,000 tons).

As might be expected from the pastoral character of most of the country, the numbers of livestock are outstanding. In the number of its sheep (32m.) the Union vies with New Zealand and the United States. The production of wool on a greasy basis is about 100,000 tons, and on a clean basis about half that quantity. Cattle are estimated at over 12m. and goats at 5½m.

South Africa is poorly timbered. Of the small percentage of the Union carrying woods and forests, much is in the nature either of scrub or of open woodlands with trees of little size. Timber forests are found, for the most part, in comparatively small patches on the seaward slopes of the mountains behind the coastal zone.

In contrast with this paucity of well wooded country is the Union's outstanding wealth in gold and diamonds; South Africa leads the world in production of both these commodities (see pages 271 and 664). To them must now be added the prospect of supplies of uranium of an estimated value of at least £30m. a year. Uranium is found in minute quantities in almost every mine on the Rand and in the Orange Free State. After prolonged research under Government auspices, with international support, a programme of extraction as a by-product of gold-mining operations was agreed, and the first of a series of special plants was opened at one of the Rand mines towards the end of 1952. Other minerals in active production in the Union are many and varied, and of one of them—platinum—South Africa is among the principal sources of world supply. Largest in quantity is coal, of which the output in 1950 was over 26m. tons, valued at over £10m. About 70 per cent. of the total is mined in the Transvaal, 20 per cent. in Natal, and 10 per cent. in the Orange Free State. Copper (33,000 tons in 1950), manganese ore (778,000 tons), asbestos (78,000 tons), and platinum (162,000 Troy oz.) were all produced on an increasing scale in the post-war years up to the half-century, and were valued in each case at some millions of pounds.

In South Africa, as in most countries, the nominal value of the overseas trade has gone up by leaps and bounds since the war, without, for most commodities, any corresponding increase in volume, and with an actual decline in some cases. In 1951, general imports were valued at £457m., against £85m. in 1938; and national exports, exclusive of gold bullion and specie, at £309m. against £28m.—eleven times as much. The proportion is lessened by the addition

of the gold exports in both years. Exact figures are not readily available. In 1938, exports of gold were between £80m., and £90m.; one figure for 1951 puts them at only £68.5m., though in 1946, the latest year for which an official figure is available, the amount was £95.5m. Exclusive of gold, the most valuable of the national exports in 1951, as listed in the *United Nations Year Book of International Trade Statistics*, was wool, affording further evidence of the importance of the pastoral industry. Wool—most of it greasy wool—was exported to the value of nearly £75m., or 24 per cent. of the total, while hides and skins and hair (angora) provided another £12m. Next in value to wool was a surprising item, or group of items, 'Jewellery, timepieces, fancy goods, &c.'—surprising because no value was assigned to the group in 1938, and ten years later it was only £0.1m., but by 1951 it had grown to close on £69m.—22 per cent. of the total. Mineral exports other than gold amounted to £50m. (16 per cent.), diamonds representing half that amount, and other principal items being copper and asbestos, coal and manganese ore. Foodstuffs (largely maize, fresh and preserved fruits, jams and sugar) and wines and other beverages added £38m. (12 per cent.) to the list. Motor cars and trucks, tyres and tubes, machinery and parts, valued at nearly £14m., brought the total of the items quoted to over 80 per cent of the whole, exclusive of gold.

Imports cover a wide range of commodities, with no very dominant item. Cotton and rayon piece goods lead easily, but neither accounts for more than a small percentage; of the £457m. at which imports were valued in 1951, these and woollen piece goods had a combined value of nearly £76m., or less than 17 per cent. Machinery and transport equipment accounted for £60m. (13 per cent.), and iron and steel plates, bars, pipes, &c., tools and wire had an import value of £21m. (nearly 5 per cent.). Mineral oils cost £28.5m. (over 6 per cent.), motor spirit being responsible for half the amount. Foodstuffs and beverages (chiefly tea, coffee, and wheat) added another £20m. (over 4 per cent.) to the import bill; and paper of one kind and another, and books, were imported to much the same value. It is significant of the scanty home supply of timber that imports of unmanufactured wood came to over £11m. (2½ per cent.). But so many and varied are the imports that all these leading items amount to only about half the total.

Half the overseas trade, both inwards and outwards, is within the British Commonwealth and Empire. In 1951 the United Kingdom supplied 35 per cent. (£166m.) of the imports, and other Commonwealth countries and dependencies 15 per cent. (£69m.), chiefly from Canada (£18m.), Malaya (£12m.), and Northern Rhodesia (£9m.). Among foreign countries the United States was an outstanding source of supply, sending goods valued at nearly 20 per cent. (£91m.) of the total, followed by Italy, Germany, Japan,

Belgium and Sweden, with individual contributions ranging from £17m. down to £10m. Of the exports, excluding gold, the United Kingdom took 28 per cent. (£86m.), and other Commonwealth countries and dependencies 22 per cent. (£68m.), with Southern and Northern Rhodesia and South-West Africa as the best customers, taking between them exports from the Union valued at £55m. For the other half of the Union's exports the best customers were France (£45m.; 15 per cent), the United States (£35m.; 11½ per cent.), Switzerland (£16m.; 5 per cent.), Netherlands (£15m.; 5 per cent.), Italy (£11½m.; 4 per cent.), and Germany (£11 m.; 3½ per cent.).

POPULATION OF LARGEST TOWNS, INCLUDING SUBURBS: 1951 CENSUS

	European	Total		European	Total
Johannesburg .	364,000	912,000	Springs .	31,500	119,000
Cape Town .	267,000	633,000	Germiston .	46,000	114,000
Durban .	130,000	420,000	Benoni .	36,500	110,000
Pretoria .	151,000	283,000	East London .	43,000	89,000
Port Elizabeth .	83,000	215,000	Brakpan .	30,000	89,000
Bloemfontein .	52,000	128,000	Pietermaritzburg .	32,000	74,000

South-West Africa, bordering the Atlantic, extends from the Cape Province northwards to Portuguese West Africa, and inland to the Bechuanaland Protectorate. After more than 60 years of European occupation (see page 658), its 318,000 square miles carry a population of under ½m. There are about 50,000 whites; the rest are various African peoples of more or less primitive type. In so large a territory the physical conditions vary, but a general characteristic is the scanty rainfall. Only in the far north is agriculture possible, to a limited extent, without irrigation. Water is sometimes found by boring, but the mainstay of the country is the pastoral industry. Sheep predominate in the south, cattle farther north. Livestock number about 5m. head, including 2½m. Karakul sheep, bred for 'Persian' lambskins, 1m. other sheep and goats, and 1½m. head of cattle. These and minerals—principally diamonds (found along the coast) and copper/lead/zinc concentrates from Tsumeb, in the Grootfontein district—constitute the main commercial wealth of the country. The sale of diamonds is controlled by a Diamond Board, and the permitted exports vary greatly. In 1951 they were valued at £8.5m., copper/lead/zinc concentrates at £5.4m., and lead vanadium concentrates at £¾m. The Karakul industry has flourished greatly, and the breed is growing in favour and in numbers. Over 2½m. pelts were exported in 1950, and the United Kingdom imports of pelts from South-West Africa in both 1951 and 1952 were valued at around £5½m. Slaughter cattle and butter are also valuable exports. Altogether, exports in 1950 were valued at £21½m., against imports valued at £13m.

Windhoek, the capital, lying in the centre of the territory at a

height of 5,500 ft., has with the surrounding district a population of some 20,000 (1951 census), half of whom are Europeans. It is linked with the Cape railways by a line of South African standard gauge (3 ft. 6 in.), which extends beyond Windhoek to Walvis Bay (see page 663) and is also connected with Luderitz Bay. There are 1,138 miles of standard gauge line, and, in the north, 350 miles of narrow gauge (2 ft.) line.

HIGH COMMISSION TERRITORIES

(See page 658)

Basutoland (11,700 square miles: half as large again as Wales) has an estimated population of 575,000, with probably another 100,000 at work in the Union of South Africa. The Basutos are among the most advanced of the South African peoples. From the western or Orange Free State border, marked by the Caledon River (tributary to the Orange), 'Lowlands' of 5-6,000 ft. rise eastward to 11,000 ft. in the Drakensberg, along the Natal border. The mountains form a main watershed, and Basutoland is known both as the 'Switzerland' and the 'Sponge' of South Africa; on its borders rise not only the Caledon and the Orange river itself, flowing to the Atlantic, but the Tugela, flowing to the Indian Ocean. It is a pastoral country, carrying upwards of 1½ m. sheep, 400,000 cattle, 600,000 goats, and 100,000 horses. Basuto ponies, despite some deterioration, are renowned in South Africa for their hardy qualities, but sheep and goats are the factor of prime economic importance. In 1951, wool provided nearly 80 per cent. of exports valued at £2·8m., and mohair (Angora goats' wool) another 9 per cent. Imports practically balanced exports in value—£2·8m. About one-sixth of the land is under cultivation and yields normally a sufficiency of cereal and leguminous crops to allow of small exports. Maseru, the capital, a township of some 2,500 people (nearly a fourth of them white), near the Caledon, is linked by rail with the Orange Free State.

Swaziland (6,705 square miles: a little smaller than Wales) has a population of some 200,000. Mbabane, the capital, and Bremersdorp, the former capital, in a less healthy situation, have each a white population of some 500. The Swazis are akin to the Zulus and have an elaborate social order. Unlike the Basutos, they have suffered from a welter of concessions granted recklessly to Europeans by former chiefs. North and west and south lies the Transvaal; to the east are Natal and Portuguese East Africa. From the High Veld (4,000 ft.) in the west the land drops through the Middle Veld to the low-lying Bush Veld. It is mixed country, with many products, but

mainly pastoral; there are some 400,000 head of cattle, about one-sixth of them on European ranches, and under 150,000 sheep and goats. The native pastures are overstocked and the surface is badly eroded. The chief exports are slaughter stock and asbestos. Swaziland has one of the largest asbestos mines in the world, with an annual output of about 30,000 tons, providing nearly 80 per cent. of the £2m. or so at which the exports were valued in 1950.

The Bechuanaland Protectorate, lying east of South-West Africa and north of the Molopo, is a big country (275,000 square miles) with a sparse population—roughly one per square mile (1950 estimate 289,000). Its distinctive feature is the Kalahari Desert, which is far from being the legendary sandy waste; a recent survey encourages hope that it may have ranching possibilities. Included in the protectorate also is a wide expanse of swampy country in the north, between Lake Ngami and the Zambezi. The leading Bechuana tribe, the Bamangwato (over 100,000), is famous for its high degree of civilisation, strikingly exemplified in its former great chief, Khama, and its capital, Serowe (16,000), though lately its progress has been checked by troubles over the succession to the chieftainship. There are over 1m. cattle in the Protectorate and nearly $\frac{3}{4}$ m. sheep and goats. Imports and exports are each around £1 $\frac{1}{4}$ m., the latter being somewhat the greater and consisting mostly of cattle (£1,158,000 in 1950), with hides and skins and butter as the main subsidiary products. The 'Cape to Cairo' railway runs through the south-eastern borders of the Protectorate for nearly 400 miles, linking Cape Province with Southern Rhodesia.

BRITISH CENTRAL AFRICA

Comprising Southern Rhodesia, a colony with responsible government, and the two protectorates of Northern Rhodesia and Nyasaland, British Central Africa forms a federated territorial unit whose full economic development is largely dependent on closer association of the parts. A scheme for their federation, devised under official auspices, was the subject of prolonged discussion between the three territories and the United Kingdom Government in 1951–53. It met with much African opposition, but was approved, on a referendum, by the white population of Southern Rhodesia, and finally endorsed by the British Parliament.

At an earlier date, in 1945, recognition of the community of interests between the three territories led to the formation of a Central African Council to co-ordinate their policies and schemes of development. Situated wholly within the Tropics, they constitute a block of over 480,000 square miles (five times the size of the United Kingdom)

with a population of 6½m. Northern Rhodesia, the largest territory (285,000 square miles), has the smallest population (1·9m.), and Nyasaland, much the smallest in size (48,000 square miles) has the largest population (2·4m.). Southern Rhodesia, intermediate in both size and population (150,000 square miles: 2·2m. inhabitants), is the most highly developed. The inclusion of Rhodesia within the British Empire was due largely to Cecil Rhodes, from whom it took its name in 1895. He had secured from the Imperial Government in 1889 a Royal Charter for the British South Africa Company to develop and administer the territories north of Bechuanaland and the Transvaal. The Rhodesias, as now known, took shape during the next dozen years, the Zambezi river becoming the dividing line between Southern and Northern. In 1923 Chartered Company rule came to an end; Southern Rhodesia was given the status of a self-governing colony, and Northern Rhodesia became a British protectorate. Meanwhile Nyasaland had enjoyed the latter status for nearly a quarter of a century. Under federation, both Northern Rhodesia and Nyasaland retain their protectorate status. The individual characteristics of the three territories are set out below.

Southern Rhodesia. Much of the territory is a tableland 4–5,000 ft., above the sea, with a climate suitable for white settlers, and at the 1951 census the population of a little over 2m., in a country three-fourths the size of France, included 136,000 Europeans. Grassy plains alternate with bush country and groups of hills, notably the Matopos, where Cecil Rhodes is buried. The largest towns are Salisbury, the capital, in the north-east (Mashonaland), with 40,000 whites and 46,000 employed Africans; and Bulawayo, in the south-west (Matabeleland), with 32,000 whites and an estimated non-European population of 35,000. The main line from Cape Town to the north passes through Bulawayo, whence another line runs to Salisbury and Beira, the Portuguese east coast port which is the ocean gateway to Southern Rhodesia. There are about 1,300 miles of railway (3 ft. 6 in. gauge) within the Colony, which in 1947 arranged to buy them from the owning company together with another 1,150 miles of connecting lines in Northern Rhodesia and Bechuanaland.

The chief crops are maize and tobacco. The maize is needed mostly for home consumption; tobacco is the leading export, accounting for close on a third of the £42m. at which the exports of domestic produce were valued in 1951. Buyers in the United Kingdom have entered into a perpetual five-year agreement with the growers to take a minimum quantity, forming a large part of the total crop. Cattle have increased to 3m. head, but there are only a tenth as many sheep; in either case a third of the stock are European-owned. A public utility corporation runs cold storage works. The dairying industry, including butter and cheese factories, is making

steady progress. Citrus fruits do well under irrigation, and several large dams have been built to provide water for that and other purposes.

Mineral resources, headed by gold, are numerous and extensive; their reputation was a primary cause of the founding of the Chartered Company. In 1950 the total output was valued at £13.6m., of which gold accounted for nearly half. Southern Rhodesia is a leading producer of asbestos, chiefly from the Shabani mining area (south-centre of the Colony). The Wankie coalfield, in the north-west, with estimated reserves of 4,000m. tons, supplies the whole of South Central Africa. Chrome ore is mined around Selukwe, and during the Second World War the United Nations drew largely on supplies from this source. The War also gave a great stimulus to industrial development.

A four-year plan provides for the expenditure of over £60m. on capital works which are in active progress.

Northern Rhodesia, like Southern Rhodesia, is mostly a high plateau country, but more typically tropical. Both the Zambezi and the Congo rise on its northern borders, and most of the protectorate falls within the Upper Zambezi basin. The population in 1951 included 37,000 Europeans. The chief settlements are along the line of the railway, which enters the territory over a bridge across the Zambezi, just below the Victoria Falls, and runs for 500 miles from Livingstone, on the northern bank, northwards to the Katanga (Belgian Congo). Lusaka, the capital, is rather more than half way.

In the far west, along the Upper Zambezi, is the highly organized native kingdom of Barotseland, but elsewhere are a multiplicity of tribes speaking many languages. The settlers grow both Virginia and Turkish tobacco, mostly around Fort Jameson, on the borders of Nyasaland. Maize is largely grown, but in recent years there has been little or no surplus for export. Cattle number under 1m., and sheep are fewer than 100,000. Timber is worked and exported to some extent, especially in the form of railway sleepers. But these are overshadowed, commercially, by the mining industry in the 'Copperbelt', which lies on the borders of the Congo State, and links up with the corresponding mineral area of Katanga across the frontier. Outside the Copperbelt is the mining area around Broken Hill, the oldest mining township in the protectorate, on the railway 75 miles north of Lusaka, producing zinc and lead; and elsewhere other mineral resources which are being investigated include iron and coal.

Development in the Copperbelt, which extends over a considerable area and contains several of the leading townships in the protectorate, has been prodigious. In 1951 the production of copper, both blister and electrolytic, exceeded 300,000 tons valued at £62m., or nearly 90 per cent. of Northern Rhodesia's total mineral output,

valued at over £71m., the balance being made up almost entirely of zinc (£5.4m.), lead (£2.25m.), and cobalt alloy (£1.4m.). Copper and other minerals provide all but a small fraction of the exports (valued in 1951 at £67m.), and have been the main factor in sending the revenue of the protectorate rocketing till in 1952 the estimates exceeded those of Southern Rhodesia. But along with this wealth the Copperbelt, dependent on skilled white miners, has confronted Northern Rhodesia with serious problems in the relations of European and African labour.

Further development of the Copperbelt is hampered by shortage of coal, which at present is drawn from the Wankie mines in Southern Rhodesia and is so inadequate in quantity that a small army of Africans (as many as 7,000) is employed in cutting wood for fuel at the mines. To meet this difficulty, and to serve other needs, Northern and Southern Rhodesia are jointly sponsoring a big scheme for hydro-electric power works in the Kafue Gorge. Meanwhile the mines have contracted for supplies of power from Katanga.

Nyasaland. Though the total area is nearly equal to that of England, nearly a fourth of it is water, the land area being about the size of Scotland, with Wales tacked on. Taking its name from Lake Nyasa, the protectorate includes the greater part of that long expanse of water (nearly half as large again as Lake Erie) at the southern end of the Great Rift Valley. The territory itself is long and narrow: a strip between the western shore of the lake and Northern Rhodesia, together with a long tongue south of the lake, thrusting into Portuguese East Africa nearly to the Zambezi river. Most of the development has been in this southern section. Through it flows the Shiré river, which issues from the southern end of Lake Nyasa and is tributary to the Zambezi, to whose level it descends in a series of cataracts about midway in its course. The whole of the Shiré valley is comparatively low-lying, but like Lake Nyasa it is bordered by highlands with a general level of 3–5,000 ft. and peaks rising to 8–10,000 ft. The lake level is about 1,500 ft., and the extreme depth over 2,300 ft., so that the bed of the lake is well below sea level.

In the Shiré Highlands are the principal European estates, on the lower slopes of Mt. Mlanje (10,000 ft.), as well as the three townships credited with urban populations. These are Zomba, the official capital; Blantyre, the commercial centre; and Limbe, the customs and railway headquarters. They are all small, with only a few hundred Europeans; the total white population of the protectorate at the end of 1950 was under 4,000.

Usually, in a new country, railway construction begins at the coast and extends inland. The reverse has been the case in Nyasaland, which has no outlet to the sea. Its first railway, built in the first decade of this century, connected Port Herald, on the Shiré river, with Blantyre; in the next decade, this was extended to the

north bank of the Zambezi, in Portuguese territory; in the third decade, a railway was built to the opposite bank of the Zambezi from the Portuguese port of Beira; in the fourth decade the Zambezi was bridged and the railway was extended from Blantyre to Lake Nyasa, so that the lake is now in direct rail communication with Beira. The gauge is 3 ft. 6 in. A steamship service round the lake maintains touch with the lake ports, and there are good motor roads which, in conjunction with the fine scenery, attract both tourist and business traffic. Nyasaland is on the line of the shortest route by road between Johannesburg and Nairobi.

The protectorate is not a great livestock country. Cattle are estimated at rather more than $\frac{1}{4}$ m. and there are large numbers of goats, but few sheep. Maize is grown for local food requirements. Tobacco (mainly fire-cured) is easily the most valuable commercial crop; tea is a poor second, and cotton a still poorer third. Tung oil (see page 228), a comparatively new product, has fallen short of early hopes. Tea is grown on European estates, tobacco mostly by Africans; cotton is almost wholly a native crop, grown along the lower Shiré. These three products provide about 90 per cent. of the exports, which in 1950 were valued at £5m., tobacco contributing £3·5m. (25 $\frac{1}{2}$ m. lb.), tea £1·17m., and cotton £230,000. Exports of tung oil were valued at only £40,000.

BRITISH EAST AFRICA

The countries of the British Commonwealth and Empire, and countries associated with them administratively, extend continuously from Cape Town to the borders of Abyssinia and the Sudan. In earlier pages they have been traced through South and South Central Africa to Northern Rhodesia and Nyasaland. Beyond these protectorates they stretch northwards through East Africa under various names and styles. First comes the Trustee Territory of Tanganyika; on its northern borders lie Kenya Colony and Protectorate and the Uganda Protectorate; off the coast of Tanganyika lie the islands of Zanzibar and Pemba, forming the Zanzibar Protectorate.

Kenya, Uganda and Tanganyika, though differing in status and having separate governments, have been drawn together by common interests. In the interval between the two world wars the East African Governor's Conference was established and developed as a consultative body with wide functions. After the second war it was expanded into the East African High Commission, comprising the three Governors, a central Secretariat and Executive, Advisory Boards, and an East African Assembly with representatives of all races and an unofficial majority. The policy is not only to co-ordinate but to bring under joint public control the inter-territorial services

of East Africa, or that part of it included in the British sphere: a sufficiently big task, for the three territories cover an area of over 680,000 square miles (larger than France, Germany and Italy combined), with a population of some 18m., nearly all Africans—an average of about 26 to the square mile.

KENYA is neither the largest nor the most populous of the three territories, nor are its exports equal in value to those of its neighbours; yet it is generally regarded as the leading member of the trio. This reputation it owes to the conditions which, early in the twentieth century, made it renowned as the 'White Colony on the Equator'. It is the most advanced constitutionally, being granted in 1948 an unofficial majority in its Legislative Council, with elected as well as nominated members.

A country of 225,000 square miles (rather larger than France), with a population of 5½m., including 30,000 Europeans and 100,000 Asians, Kenya is crossed by the Equator along the northern slopes of snow-clad Mt. Kenya (17,040 ft.). A strip of coastal territory 10 miles wide ranks officially as a protectorate; it is part of the mainland territories formerly administered by the Sultan of Zanzibar, to whom rent is still paid for it by the British Government. Otherwise the whole of Kenya is a Colony, annexed to the Crown. The greater part of it is arid, especially in the north, where it borders on Abyssinia, and in the north-east, where it borders on Somalia. Development is mostly confined to the southern part of the Colony, and especially the south-west, where the Kenya Highlands provide conditions favourable both to farming and to European settlement.

This region was opened up at the end of the nineteenth century by the construction of a remarkable railway (metre gauge). Starting on Mombasa Island, which shelters one of the finest harbours (Kilindini) on the east coast of Africa, it crosses to the mainland over a causeway and ascends the coastal region, which varies from luxuriant tropical plantations to dry scrub. At Kiu, 270 miles from Mombasa, the line has climbed 4,860 ft., and it is only then that the settlers reckon they are passing from the tropical climate of the coast into the more temperate conditions of the Highlands. Another 60 miles and another 600 ft. of altitude bring the traveller to Nairobi (5,475 ft.), the capital. It was a collection of shanties when the line was built; now it is a city of wide boulevards and fine public buildings, the home of about 140,000 people, including over 15,000 Europeans and 50,000 Asians.

Beyond Nairobi the line climbs to 7,830 ft.; descends the western escarpment of the Aberdare range to mixed farming country around Lakes Naivasha and Nakuru (6,000 ft.) in the Great Rift Valley; climbs the opposite side of the valley to Mau Summit (8,322 ft.), and finally drops to 3,758 ft. at Kisumu, on Lake Victoria, 587 miles from Mombasa. There it connects with a steamship service on the lake,

which is the second largest fresh water lake in the world (the third if the Caspian Sea be included), nearly as large as Scotland and not much smaller than Lake Superior.

The last 135 miles of this pioneer railway are no longer part of the main line, which now continues from Nakuru round the northern end of Lake Victoria to serve Uganda; on the way it reaches a height of 9,150 ft., and the distance to Kampala from Mombasa is 871 miles. Many branch lines have been built, mostly serving farming country, bringing the total length of the Kenya and Uganda Railways to over 1,600 miles. In 1948 the Kenya and Uganda Railways were amalgamated with the Tanganyika Railways (see under Tanganyika) making a unified system of over 3,000 miles of open line. They are supplemented by nearly 1,800 miles of road services and over 4,000 miles of marine services on the Great Lakes and the Nile. An extensive network of roads has been constructed—20,000 miles in Kenya alone—and motoring is widespread.

One branch railway runs towards the Tanganyika border to Lake Magadi, famous for its deposits of carbonate of soda, which are manufactured into caustic soda for export; in 1951 the value of these exports was nearly £1·2m. Gold is mined in the Kakamega district north of Kisumu, and there are a few other mineral products, all of comparatively small value. The chief wealth of Kenya, as at present developed, lies in its farms and plantations and associated industries, especially dairying, cereals, coffee (*arabica*, or 'mild'), sisal, and tea. During the Second World War there was a big development in the cultivation of pyrethrum, a daisy-like flower which, when dried and crushed, makes a powerful insecticide. In 1946, pyrethrum headed the list of Kenya's domestic exports, with a value of nearly £1·2m. out of a total of £7·1m.; but in 1951 its export value had dropped to £357,000 out of a total of £24m. Sisal headed the list in 1951 with a value of £6·9m., and was followed by coffee, £4·1m.; hides and skins, £2·2m.; cereals (including wheat meal and flour), £1·8m.; tea, £1·4m.; and wattle bark extract, £1·3m. These six items accounted for nearly 75 per cent. of the domestic exports; with sodium carbonate and pyrethrum, previously quoted, they made up 80 per cent. of the total.

Maize is very widely grown both by Europeans and by Africans, but is mostly consumed locally. Livestock do well in the Highlands. The Africans reckon their wealth by their herds and flocks, and are estimated to have 4m. cattle, 3m. sheep and 4m. goats. But they are more concerned with quantity than quality, and though hides and skins figure among the leading exports, the most promising factor in the livestock industry is the introduction of pure-bred cattle and sheep by the white settlers.

UGANDA. In 1862 the pioneer explorers, Speke and Grant, visited a country on the north-western shores of Lake Victoria in

marked contrast with the primitive lands through which they had previously passed. The people, though living under a despotic ruler, were more intelligent than their neighbours, better clothed, more highly organized. They were the Baganda of Buganda (anglicised as Uganda). Later, they were visited by the explorer Stanley, and as a result of his report both Protestant (British) and Catholic (French) missionaries went out. A new and barbarous ruler started a reign of terror. Captain (later Lord) Lugard, representing the Imperial British East Africa Company, acting under a charter, arrived at the end of 1890 and hoisted the British flag. A troubled decade followed. There were many rivalries and disturbances, in the midst of which a British protectorate was proclaimed in 1894.

Once the *Pax Britannica* had been established, the Baganda soon justified their reputation. Buganda and various neighbouring territories now included in the protectorate have become an outstanding example of African progress, under the guidance of British rule and missionary influence. Buganda itself (25,000 square miles: one-third water) is a little smaller than Scotland, and the whole protectorate (94,000 square miles) a little larger than Great Britain. The population (over 5m.) is about the same as that of Kenya, but the whites number only about 3,500. There are ten times that number of Indians, who play an important part in the business life of the country. For the most part Uganda is not a white man's country; but though very different in its development from Kenya it has no less distinctive a place in British Africa. It is one of the few African territories under British rule where efforts to promote cotton-growing have met with any large measure of success. Cotton is the economic mainstay of Uganda. It is grown as a rain crop by a host of small farmers, mostly in Buganda and the Eastern Province; about 1½m. acres are planted, and 340–390,000 bales (60–70,000 tons) of cotton are produced. Practically the entire output is exported, and cotton is far and away the most valuable item of trade. Coffee comes next. Uganda produces more coffee than any other Commonwealth country—nearly as much in 1951 (42,500 tons) as the others combined. It is grown by both Europeans and Africans, with the Baganda again well to the fore. The *robusta* ('hard') type has largely displaced *arabica* ('mild') coffee, except in the Bugishu district. Tobacco, the third most valuable export, has been a success in the west of the protectorate. Out of domestic exports valued at £47·2m. in 1951, raw cotton accounted for £28·7m. (over 60 per cent.); coffee (hulled), £13·3m. (28 per cent.); and hides and skins (undressed), £1·2m. These three commodities, providing over 90 per cent. of the domestic exports, are the only considerable items. It should be noted that the returns do not include exports to Kenya and Tanganyika, estimated in 1951 at £4·3m.

Both in the north-east and south-west of the protectorate are pastoral areas where the tribes live by raising and trading cattle; and altogether Uganda is credited with about 2½m. cattle, as many goats, and 1m. sheep. But there is no export of meat, and hides and skins provide only 2 to 3 per cent. of the exports. Commercially, Uganda must be regarded as an agricultural country.

This is the present position; there are wider possibilities. Uganda lies at the heart of Equatorial Africa. Within its borders the infant Nile issues from Lake Victoria at Jinja, passing over Ripon Falls, and two or three miles lower down are Owen Falls—site of a great hydro-electric power station which is being built at a cost of over £7m., and will supply power for industrial development throughout the protectorate.

On the opposite (western) side of Uganda, where it marches with the Belgian Congo, the frontier passes through Lake Albert and Lake Edward—more headwaters of the Nile—and through the fabled Mountains of the Moon, which in Ruwenzori rise to nearly 17,000 ft. Copper has been found at Kilembe, on the eastern (British) slopes of Ruwenzori, and it has been proposed to canalise a river to facilitate transport of the ore to Lake Victoria and across the lake to Jinja, for treatment at Owen Falls in smelting works run by hydro-electric power. Extension of the railway westward from Kampala is also projected.

Jinja is the commercial capital of Eastern Uganda. It is on the main line from Mombasa to Kampala (see page 679), and is also connected by railway along the unnavigable reaches of the Nile northwards to Namasagali, on Lake Kioga (steamer service). Kampala is the commercial capital of Buganda and the principal town in the protectorate. It is built on seven hills, each forming a distinctive part of the town. One (Mengo) is the seat of the native government of Buganda and of the Kabaka (ruler). Other hills are headquarters of the missionary enterprise which has been so great a feature of the development of Uganda, with large Protestant and Catholic cathedrals and hospitals. On yet another is Makerere College, which is to be developed into the University of East Africa. Entebbe, the official capital of the Protectorate, is 25 miles away, on the shore of Lake Victoria.

TANGANYIKA. After the First World War, the mountainous north-west corner of German East Africa, comprising the Ruanda-Urundi country, about two-thirds the size of Scotland, was added to the Belgian Congo under mandate; the Kionga triangle, a tract about the size of a small English county in the extreme south-east, south of the mouth of the Rovuma river, became part of Portuguese East Africa; all the rest was mandated to Britain and re-named Tanganyika Territory after the great lake which bounds it on the west.

Covering 360,000 square miles (including 20,000 square miles of water), the Territory is four times the size of Britain, but carries only one-sixth as many people—about 8m. in 1952, including 18,000 Europeans and 77,000 Asians. It shares with its neighbours parts of three of the Great African Lakes—Victoria and Nyasa as well as Tanganyika; and within its northern border, hard by Kenya, is the highest mountain in Africa—snow-capped Kilimanjaro (19,565 ft.). It has a coastline of 500 miles bordering the Indian Ocean, backed by an irregular belt, in places reaching 200 miles and more inland, sloping up to about 1,500 ft. Behind this belt the land rises more rapidly, forming the escarpment to a broad plateau of 3–6,000 ft., dropping again in the west to the lake levels, which are like giant steps descending from north to south (Lake Victoria, 3,726 ft.; Tanganyika, 2,590 ft.; Nyasa, 1,600 ft.).

The Central Railway (metre gauge) bisects the Territory. From Dar-es-Salaam, the capital and chief port (population over 75,000), it runs westward to Kigoma, on Lake Tanganyika, a distance of 775 miles, and connects with the southern end of Lake Victoria at Mwanza by a branch line of 236 miles, running north from Tabora. The main line traverses diversified country with a wide range of products—sisal, groundnuts, cotton, rice, maize, millet in the low-lying country; millet and pulses on the plateau, where, however, there are long stretches of thorn-bush country, with little cultivation. Much of the plateau has a scanty rainfall and is better suited to grazing than to agriculture. Only about a fifth of the whole Territory is stock-raising country, the rest being infested by tsetse fly, but it is estimated that the Africans own 6½m. cattle. Horses and mules are too few to be put on record, but donkeys are fairly numerous. Sheep number nearly 2½m. and goats over 3m.

The railway reaches a height of 3,900 ft. at Tabora, long the chief town in the interior and now also an important airport. The height is not enough to make the plateau a white man's country in the same sense as the Kenya Highlands; but in the south-west, especially around the northern end of Lake Nyasa, where the Livingstone Mountains rise to about 10,000 ft., there are uplands for which comparable claims are made. In the north-east, a railway from Tanga (24,000), the second town and port in the Territory, winds for nearly 300 miles through rich plantation country up to Moshi (2,657 ft.) at the foot of Kilimanjaro, and on to Arusha (4,620 ft.), on the slopes of Mt. Meru (15,000 ft.). A branch line 91 miles long, starting near Moshi, connects with the Kenya Railway at Voi, 104 miles from Mombasa.

Until after the Second World War the chief agricultural development of Tanganyika, regarded commercially, was located in this north-east corner of the country. Here, within 50 miles of Tanga, is the world-famous Amani Institute for agricultural research, sup-

ported by grants from the Imperial Treasury and all the East African dependencies. The Tanga Railway carries sisal and copra from the lower-lying country along its route, and coffee and tea from the highlands. Tanganyika is the world's chief source of supply of sisal, which is grown throughout the Territory, but chiefly in the north, and is easily Tanganyika's most valuable export. Over 200 works with over 20,000 employees are engaged in processing the fibre, which is largely shipped through Tanga. Total exports of fibre and tow in 1951 amounted to 142,000 tons, and a spectacular rise in prices sent up the export value to £23.7m.—as much as the total value of all Tanganyika's domestic exports in 1950. A still more spectacular fall in prices followed in 1952, and though the crop in that year was estimated at a new record—over 160,000 tons—some fall in export value was indicated.

Such is the dominating position of sisal in Tanganyika's overseas trade that in 1951 it provided 60 per cent. of the total value of the Territory's domestic exports, which amounted to £40m. Coffee came next, with 16,500 tons valued at £4.5m. (11 per cent.). Most of the supplies come from the Bukoba district, on the western shore of Lake Victoria, and are grown by Africans, who cultivate both the *arabica* and *robusta* types; but much coffee is also grown on the slopes of Kilimanjaro and Meru by European planters, cultivating *arabica*. Third in the list of domestic exports in 1951 was raw cotton, with 8,300 tons valued at £2.8m. (7 per cent.), and fourth came undressed hides and skins, valued at £1.7m. (4 per cent.). Altogether these four products—sisal, coffee, cotton, and hides and skins—provided 80 per cent. of the exports by value.

Other products, both for export and for home consumption, are many and varied, with prospects of extensive development. But the case for making haste slowly has been strengthened by the outcome of a big scheme which was launched by the Imperial Government after the Second World War, to promote agricultural development based on groundnut cultivation. Large areas were allocated for the purpose in central, western, and southern Tanganyika, but unexpected difficulties were encountered, and after heavy losses the scheme was drastically curtailed and is now being pursued on experimental lines which will, it is hoped, yield useful information on tropical cultivation under mechanised conditions. Useful legacies of the original scheme are a new port, Mtwara, near the southern end of the coast, and a railway into the southern interior.

A large part of the Territory—about 40 per cent.—is wooded, and there are valuable timbers in the forests. The lumbering and sawmilling industry is already considerable. Tanganyika is also rich in mineral resources which, as yet, have scarcely been tapped. They include gold, diamonds, coal, iron ore, and lead. Gold was exported in 1951 to the value of over £800,000, and the discovery of a Kimber-

lite pipe south of Lake Victoria in 1940 put Tanganyika definitely on the diamond map of the world. After the war, a dispute over prices with the controlling interests in the diamond trade restricted exports for two or three years, and in 1951 the diamond exports from Tanganyika were valued at only £85,000; but the dispute has since been settled and in 1952 the Governor estimated the diamond exports at £3-4m. a year, which places them high in the list after sisal.

ZANZIBAR. Zanzibar Protectorate includes the island of that name (greatest length 53 miles, width 24 miles, area 640 square miles—about half that of Cornwall) and the island of Pemba (380 square miles), 25 miles to the north. Both islands lie off the coast of Tanganyika Territory, from which they are separated by a channel about as wide as the Straits of Dover. The Sultan rules through an Executive and a Legislative Council, and is guided by the advice of a British Resident. He is of Arab descent, of the same family as the Sultan of Muscat; both celebrated in 1944 the bi-centenary of a common ancestor who founded the dynasty. The modern importance of the fact lies in the powerful Arab element in the population and the commercial ties which keep a fleet of trading dhows in service between Zanzibar and Muscat. The protectorate population of over $\frac{1}{2}$ m. includes some 200,000 Africans, 45,000 Arabs (the land-owning class), 16,000 Indians (the merchant class), and 300 Europeans. Zanzibar city, the capital and chief port, has nearly 50,000 inhabitants.

Zanzibar is renowned as 'The Island of Cloves', and Pemba shares its fame. Cloves are the dominating factor in the trade of the protectorate, and it has been reckoned that the two islands produce four-fifths of the world's supply. About 50,000 acres are under cloves; 4m. trees are in bearing; and over a long period of years production has averaged some 20m. lb., with a pre-war export value of around £500,000. Crops vary greatly from year to year, and the fluctuations in quantity, coupled with other factors affecting prices, have brought about the usual anomalies in post-war trade. In 1949, when the clove crop was small, exports were 17m. lb., valued at £844,000. In 1950 there was a bumper crop and exports more than doubled in quantity (nearly 40m. lb.), while their value, despite the more plentiful supplies, nearly quadrupled (£3·2m.). In 1951 the value of the clove exports further increased to £4·3m., and though 1952 brought another small crop, prices soared to 805sh. per cental (100 lb.), or more than ten times the price (79sh.) at which a cental sold in January 1950. A secondary industry is the distillation of clove oil and clove stem oil—a comparatively minor adjunct to the main industry, yielding for export in 1950 nearly 305,000 lb. of oil valued at £114,000. In 1951 the export value of the oil was £156,000, bringing the combined value of the trade in cloves and oil up to nearly £4 $\frac{1}{2}$ m.

For some years now, there has been anxiety about the future of the industry because of an outbreak of the disease known as "Sudden Death". As with "Swollen Shoot" disease in the cocoa plantations of the Gold Coast, the only known remedy is to cut out the diseased trees, but this has not been deemed to be practicable in Zanzibar because of both local opposition and the heavy cost.

Second only in commercial importance to the clove industry are the products of the coconut palm. In 1949, when accumulated supplies were available, the exports of copra, coconut oil, oil cake and soap even took the lead, with a combined value of over £1m., while the exports of cloves and clove oil were less than 1m. In 1950 coconut products dropped below the million mark in export value, while the rocketing of clove prices, previously mentioned, sent the clove industry far ahead again in value. None the less, coconut products, with more stable values, are an industry of growing importance. Copra has practically disappeared as an export in that form, all the supplies being taken by the oil mills, which are flourishing and improving their equipment. Altogether the clove tree and the coconut palm provided 85 per cent. of Zanzibar's total exports in 1950, valued at £5m., and practically the whole (over 98 per cent.) of the domestic exports. In 1951 there was a further increase in the total value of exports to £6.2m.

BRITISH WEST AFRICA

Whereas in East Africa the various territories under British control are linked together geographically, in West Africa the four British dependencies—Nigeria, the Gold Coast, Sierra Leone, and Gambia—are separated one from another, each being embedded in the vast expanse of French West Africa. Lying between 4° and 14° N. latitude they have a good deal in common, and a joint relationship which invites co-operation. This was provided before the Second World War by a Governors' Conference; during the War, by a West African War Council under a British Minister of Cabinet rank, with headquarters at Accra, the capital of the Gold Coast; after the War, first by a West African Council with the Secretary of State for the Colonies as chairman, and later (1951) by a West African Interterritorial Conference presided over by the Governor of Nigeria. But while there is community of interests, combined with co-ordination of policy, there is also great diversity of size and economic importance. To take the two extremes, Nigeria is over 90 times the size of the Gambia, has nearly 100 times its population, and normally exports produce worth 30 to 40 times as much.

Nigeria takes its name from the river Niger. It is roughly a square block of territory, with sides of 600–700 miles, in the angle of the Gulf of Guinea where the general trend of the coast is east and west. The Niger flows in from the north-west, follows a south easterly course to near the centre, then turns and flows south to the Gulf. Its main mouth is in the centre of the coast, but the delta spreads out so far on either side and has so many channels, connecting with one another and with other rivers beyond the delta, that almost the entire seaboard is backed by a network of waterways. The rivers and creeks are separated by mangrove swamp forests, which the silt brought down by the Niger is gradually extending seaward.

This coastal belt has a depth of 10 to 60 miles. Behind it lies a belt of tropical 'rain forest' and oil-palm bush, stretching north for another 50–100 miles. As the land rises, the forest changes to open woodlands, which in turn give place to grasslands with patches of scrub, until in the far north desert conditions are encountered on the verge of the Sahara. In the north-east corner is Lake Chad, which in its fullest extent (estimated at 20,000 square miles) is second only to Lake Victoria among African lakes, and is not much smaller than Lake Michigan. But it is comparatively shallow, and subject to great fluctuations in size, like Lake Ngami in the Kalahari.

Near to where the Niger turns south it is joined, at Lokoja, by its great tributary the Benue, flowing from the east and forming with the Niger itself, above the confluence, a continuous line of rivers stretching across Nigeria and dividing it into two parts, northern and southern. To the north is plateau country, generally of no great height (about 2,000 ft.), but rising to over 6,000 ft. in the Bauchi Plateau, which covers some 2,000 square miles north of the Benue and is noted for its tinfields. Elsewhere the surface is broken by scattered hills, but there is little mountainous country except along the eastern border, where a strip of the former German Cameroons is attached to Nigeria under-British trusteeship. The Cameroons Mountain, near the coast, rises to 13,350 ft. The great bulk of the Cameroons has been entrusted to France, so that here, as almost everywhere in West Africa, the British have French neighbours.

The total area of Nigeria, including the trustee territory (less than a tenth of the whole), is 372,000 square miles, or more than four times the size of Great Britain; with 30m. inhabitants it contains over a third of the population of the British colonial empire. Its people and its resources are as diversified as its geographical conditions. At the western end of the coast is the Colony of Nigeria (1,380 square miles; about the size of Cornwall), including the capital city and port of Lagos (250,000), situated partly on an island in a lagoon and partly on the adjacent mainland. All the rest of the territory is a Protectorate, divided into three 'Regions'—Northern, Western and Eastern—containing between them 26 provinces. The

Colony also is included in the Western Region. The Northern Region is by far the largest, extending across the whole country from east to west, and from the northern boundary to 50–100 miles and more south of the Niger and the Benue. It comprises three-fourths of the total area and rather more than half the total population. The Western and Eastern Regions divide between them almost equally the remaining fourth of the territory, stretching to the sea; and more unequally the remaining 40–50 per cent. of the population, the Eastern Region having the bigger share. As these particulars show, the Western and Eastern Regions, though each smaller than the Northern in both area and population, are the more densely populated.

The mangrove swamps bordering the coast produce little, their inhabitants living by fishing and trading. The forest zone yields valuable timbers, including mahogany, and the oil-palm is one of the mainstays of the export trade. In forest clearings, and in the more open country beyond, there is a good deal of cultivation. Cocoa is another major crop for export, especially north of Lagos.

In the Western Region are important native states, with influential rulers. The largest town, Ibadan, has as many as 500,000 inhabitants, and there are several with between 50,000 and 100,000. The Eastern Region is in some ways more primitive, but has in addition to forest products the Udi coalfields, centring in Enugu, and now controlled by the Nigerian Coal Corporation, which is analogous to the National Coal Board in the United Kingdom. The annual output is over $\frac{1}{2}$ m. tons, which in the past has not only supplied local needs but left a surplus for export from the modern Port Harcourt, some 40 miles up the Bonny river. With the growth of consumption in Nigeria by the railways, marine services, &c., very little is now available for export.

Throughout southern Nigeria fetish worship is common, despite the spread of Christian and Moslem influence. The Northern Region, though not without its complement of pagan communities in remote strongholds, is essentially Mohammedan in its civilization. Many of the provinces are Sultanates (Sokoto and Bornu) or Emirates (Kano, Katsina, Zaria, &c.), founded by Fulani overlords who came from the East centuries ago and are of different stock from the West Coast negro. Though modified by inter-marriage they still constitute the ruling caste and form a distinct linguistic group. It is easier to distinguish the people of Nigeria by language than by race. Besides the Fulani, outstanding linguistic groups are the Hausas and, in the south, the Ibos and Yorubas.

The walled cities of the Fulani are famous, notably Kano (110,000), chief trading centre of the Northern Region, the goal of the camel caravans from the Sahara and the headquarters of Nigeria's groundnut industry. In 'bumper' years, crops range up to nearly

400,000 tons, and supplies often accumulate because of transport delays on the railways. The Northern Region is, too, the main seat of the livestock industry, especially the cattle industry, which is largely banished from the south by the tsetse fly. Over 90 per cent. of Nigeria's 7-8m. cattle are found in the North, in areas free from tsetse. Cattle for meat are railed to Lagos, and there is a big trade in hides and skins—the latter chiefly from goats, which are nearly as numerous as cattle and much more so than sheep. Also in the North the British Cotton Growing Association has done much to introduce and encourage the cultivation of American-type cotton, with limited success. Not least in commercial importance is the alluvial tin-mining on the Bauchi Plateau, around Jos. In the process of dressing the concentrates to tin ore of shipping grade, columbite (ore of columbium) is separated as a by-product and sent to the United States, where it is used for stainless ductile steels and welding. The tin ore is sent to Britain to be smelted.

Nigerian trade has made substantial progress in recent years. As in most countries, the post-war increase in its nominal value has been very much greater than the increase in volume. In the six post-war years, 1946-51, apart from cotton, which doubled or trebled the quantity of its exports, and bananas, which were exported from the Cameroons Trustee Territory on a rapidly expanding scale, the big individual exports mostly registered an irregular increase in volume of 25-75 per cent. On the other hand, the sterling value of the exports increased more than 400 per cent.—from £25m. to £130m. The chief items in the 1951 total were:

Commodity	Quantity	Value
Cocoa	121,000 tons	£36.6m.
{ Palm kernels	347,000 „ (a)	£21.9m. }
{ Palm oil	150,000 „ (b)	£14.1m. }
{ Groundnuts	141,000 „ (c)	£10.1m. }
{ Groundnut oil	4,000 „	£0.5m. }
Tin ores	11,750 „	£9.0m.
Rubber	21,000 „	£8.2m.
Hides and Skins	275,000 cwt.	£7.9m.
{ Cotton: Lint	15,000 tons	£5.3m. }
{ Seed	21,000 „	£0.4m. }
{ Logs	16.8m. cu. ft.	£5.1m. }
{ Sawn timber	1.0m. cu. ft.	£0.5m. }
Bananas	1.4m. cwt.	£2.2m.

(a) 410,000 tons in 1950. (b) 173,000 tons in 1950.

(c) Much below the average; 317,000 tons in 1950.

Four Marketing Boards have been established, dealing respectively with the trade in cocoa, oil palm products, groundnuts, and cotton. The Boards have a monopoly of buying and selling their respective commodities, and the aim in each case is to regulate the price paid to the producer so as to even out the differences in good

and bad years in world prices, at which the commodities are sold. In practice the Boards have made very large profits; in 1952 their combined reserves exceeded £70m.

To carry the growing volume of trade Nigeria has 1,900 miles of railway; 20,000 miles of all-weather roads, of which 7,000 miles rank as trunk roads and 1,100 miles are tarred; and long stretches of navigable waterways through coastal swamps. The Niger is navigable for nearly 550 miles, up to Jebba, where the main line of railway crosses the river; and the Benue for nearly the whole of its course within Nigeria, up to Yola, 467 miles from its junction with the Niger at Lokoja, which is some 340 miles from the coast. But navigation is made difficult by shifting sandbanks, and both rivers are remarkable for the range of their annual rise and fall, which on the Lower Niger (that is, below Jebba) may be as much as 35 ft. It is only in the later months of the year that vessels of any size can ascend either river. Up to June the depth may be only 3 or 4 ft. At high water (July-October on the Niger; August-September on the Benue) vessels drawing 7 or 8 ft. can reach both Jebba and Yola.

There are two principal railways. First and foremost is a line traversing the country from south-west to north-east. From Lagos it passes via Ibadan through the thickly populated provinces of Abeokuta and Oyo into the Northern Region, crosses the Niger at Jebba (303 miles), continues through Zungeru, Minna, Kaduna (566 miles), and Zaria to Kano (705 miles), and thence to its terminus at Nguru (847 miles), near the northern border. The general elevation is between 1,000 and 2,000 ft., the latter altitude being just exceeded at Zaria (2,100 ft.). Various branches total over 400 miles. The other main line runs north from Port Harcourt to Enugu (151 miles) for the Udi coalfields; continues to Makurdi (290 miles) on the Benue, which is crossed by a rail and road bridge half a mile long; and finally joins the line from Lagos at Kaduna (569 miles). It will be seen that Kaduna is practically equidistant by rail from Lagos and Port Harcourt.

From Kafanchan, 100 miles short of Kaduna on the Port Harcourt route, an important branch of 3 ft. 6 in. gauge connects with Jos, the 'metropolis' of the tin mines, 63 miles from the junction and 632 miles from the port. Before this railway was built, the products of the mines were carried by light railway from Jos to Zaria (133 miles) *en route* to Lagos (750 miles). The light railway is 2 ft. 6 in. gauge (it has to climb to 4,500 ft.), so that it was necessary to tranship freight at Zaria, and though the narrow gauge line is still used for the transport of locally grown cotton, it was naturally superseded for tin by the Port Harcourt line, which not only provides through transport but shortens the route to the point of shipment by over 100 miles.

A new constitution which came into force in 1952 gave Nigeria

a large measure of self-government of a federal character, but this soon broke down over Regional differences in outlook, which found violent expression in 1953 when the South started a political campaign in the North to accelerate a movement for Nigerian independence. After full discussion the British Government introduced a new Constitution providing for greater Regional autonomy and reducing the central authority to a minimum.

The Gold Coast is a good example of the varied status not only of different dependencies in the British colonial empire, but of parts of the same dependency. It embraces four territories: (1) Adjoining the coast—which runs roughly east and west along the Gulf of Guinea—the Gold Coast Colony, about three-fourths the size of Scotland. (2) North of the Colony, and about the same in size, the African confederacy of Ashanti, annexed in 1901 after conquest, but not proclaimed a colony. (3) North of Ashanti the Northern Territories, as large as Scotland; they were proclaimed a protectorate in 1901. (4) Along the eastern border of these three territories a tract nearly twice the size of Wales, being that part of former German Togoland for which Britain is trustee on behalf of the United Nations. Together these four territories, forming a compact rectangular block, have an area of 91,690 square miles (a little larger than Great Britain), with an estimated population of nearly 4½m., over half of whom live in the Colony proper, a fifth in Ashanti, and a fourth in the Northern Territories. For administrative purposes, British Togoland is attached partly to the Colony and partly to the Northern Territories, and is included in these estimates.

Politically, a radical change in the status of the Gold Coast took place in 1951, when large powers of self-government were granted under a constitution which established a Legislative Assembly of 84 members (75 of them elected, directly or indirectly, by popular vote) and an Executive Council, or Cabinet, of a dozen Ministers, a majority of them members of the Assembly, to which they were answerable for their several departments. Certain powers were reserved to the Governor, but in effect the new constitution made the Gold Coast independent in local affairs, and this was emphasised in 1952 when the Leader of the Government Party was accorded the title of Prime Minister.

The coast, some 330 miles long, is surf-bound and has, generally, a low sandy foreshore threaded by lagoons. It lacks natural harbours, though many historically famous towns are scattered along it—Axim, Sekondi, Elmina, Cape Coast, Winneba, &c. The most important towns to-day are Accra, the capital, a city of 140,000 people ably run by an African City Council with an all-African staff, but whose only harbour facility is a small breakwater providing shelter for surf-boats and lighters; and Takoradi, a town near Sekondi, with a joint population of 50,000 and a modern deep-water harbour con-

structed between the two world wars, capable of accommodating the largest vessels engaged in the West African trade.

Forest comes nearly down to the coast in the west, but eastward a coastal belt of rolling plains and scrub, with occasional isolated hills, widens out to a depth of 60 miles on the frontier. The coconut palm flourishes all along the coast. North of this belt the forest area extends through practically the whole of the Colony and the south-western half of Ashanti. It is broken by ridges of hills and is of inestimable value to the Gold Coast both as a protection against aridity and as a direct source of wealth. Not only does it yield valuable timbers, but here is found the oil-palm and here is the home of the dominant factor in the Gold Coast trade—the cocoa industry. This industry, which has been built up since the closing decade of the nineteenth century by the labours of peasant farmers and has largely superseded the cultivation of the oil-palm, was threatened in the 'thirties of the present century by the appearance of a new disease, Swollen Shoot, among the cocoa trees. During the Second World War the menace grew to one of the first magnitude. The only known remedy is to destroy the diseased trees, and the Government of the Gold Coast has tried to enforce such action, but has met with much opposition.

Beyond the forest, in Northern Ashanti and the Northern Territories, while the rivers are mostly bordered by dense belts of trees and scrub, in between are open woodlands and parklands, orchards and plains. Especially notable is the vast number of shea-nut trees, capable, it is estimated, of providing a $\frac{1}{2}$ m. tons of shea-butter a year.

The general elevation of the country is not great—under 1,000 ft., but some of the hills rise to 2,000 ft. and, on the eastern border, nearly 3,000 ft. On the whole the country is well-watered, though the rivers are not navigable (except by canoes) for any great distance inland; north of the forest they are apt to flood after rains and shrink to pools in the dry season. Much the biggest river is the Volta, whose two main headstreams, the Black and the White Volta, come from afar in French West Africa and, with their tributaries, water the whole of the Northern Territories, near whose southern border they unite and continue south to form the eastern boundary of Ashanti and the Colony. Proposals, supported, provisionally, by the United Kingdom and Gold Coast Governments, have been made for a big scheme of development on the lower Volta, including the building of a dam to form a great reservoir, which would serve as a source of hydro-electric power for the manufacture of aluminium from bauxite, and would extend navigation nearly to the junction of the Black and White Voltas. Whatever the fate of this project, work has already begun on the building of a new port, Tema, between Accra and the mouth of the Volta.

At present, communications in the Territory are mainly by road and railway. The road mileage is 6-7,000, to which all-weather roads contribute over 2,500 miles; over 600 miles have a tarred surface. Both Accra and Takoradi-Sekondi are connected by rail (3 ft. 6 in. gauge) with Kumasi, the capital of Ashanti, the respective distances being 190 miles and 176 miles; various branches bring the total railway mileage up to about 500. Kumasi is a town of about 80,000 inhabitants. Tamale, the chief town and administrative headquarters of the Northern Territories, contains some 16,000 people.

Forty miles inland from Takoradi the railway passes through Tarkwa (whence there is a branch to Prestea), and 125 miles inland through Obuasi (in Ashanti)—modern centres of production of the precious metal whose abundance, in the early days of African exploration, gave the Gold Coast its name. Not only gold mining but other branches of mineral production, notably manganese ore and industrial diamonds, are important factors in the export trade, which is not so very much behind that of Nigeria, despite the difference in size and population of the two countries. In 1951, exports were valued at over £91m., which was just about the value of Nigeria's exports in the previous year. Cocoa contributed 66 per cent. of the total; gold, diamonds and manganese ore 24 per cent., and unmanufactured timber another 5 per cent., leaving only 5 per cent. for all other products. In view of the Volta project it may be noted that the exports of bauxite were 129,000 tons, valued at £226,000. Quantities and values of the main items were:

PRINCIPAL EXPORTS, 1951. TOTAL, £91½m.		
Commodity	Quantity	Value
Cocoa	229,500 tons	£60·3m.
Gold	692,300 oz. troy	£8·6m.
Manganese ore	806,000 tons	£7·2m.
Industrial diamonds	1·7m. carats	£6·0m.
Unmanufactured timber	9·8m. cu. ft.	£4·9m.
		<hr/> £87·0m.

Sierra Leone. The Colony and Protectorate of Sierra Leone are an outcome of the anti-slavery movement at the end of the eighteenth century. William Wilberforce and his fellow-workers founded a settlement for freed slaves at the foot of a lofty peninsula sheltering an excellent harbour; the land was ceded to them by the local chief, and they named the settlement Freetown. That was in 1788; to-day Freetown is a city of over 65,000 people, the capital of a British dependency stretching along the coast for 210 miles and covering an area of nearly 28,000 square miles—almost the size of Scotland. The peninsula on which the city stands follows the general direction of the coast and is really a short mountain range, 25 miles

long and 10 to 12 miles across at its widest, rising to conical peaks of 2,000 to 3,000 ft. It is a notable feature of the West African coast, which is generally low-lying, and the harbour which it shelters is also outstanding on the West Coast.

Two explanations are offered of the name Sierra Leone (Lion Mountains), which was given to the peninsula by fifteenth-century Portuguese navigators. Some attribute it to the supposed resemblance of part of the mountain crest to the figure of a lion; others think that the reverberations of thunder among the mountains suggested the roaring of lions to the discoverers. However that may be, the name has been extended in modern times to cover the British colony and protectorate which have spread from Freetown. The colony is in bits and pieces, which all told are about the size of Devon, and of these only the peninsula and certain islands are administered as a colony; other scattered areas are merged in the protectorate administration, which took a big stride forward in 1946, when a Chief Commissioner was appointed and a Protectorate Assembly instituted, with headquarters at the inland centre of Bo. There was a further development in 1951, when a new constitution provided for a Legislative Council for the whole territory, with an unofficial majority and power to legislate for both the Colony and the Protectorate. The Governor is advised by an Executive Council which also has an unofficial majority.

Apart from the peninsula, the coast is edged with mangrove swamps and backed by rolling wooded country, varied by low ranges of hills. In the north and east the territory rises to a plateau of some 1,500 ft., with peaks of over 6,000 ft. near the frontier. This is bordered for the most part by French Guinea, but in the south-east, for about 150 miles from the coast, the negro republic of Liberia is neighbour.

In general, Sierra Leone is a country of tropical heat with torrential rains during six months of the year. It is well watered by rivers, many of which are navigable for 20 to 30 miles from the coast by vessels drawing up to 7 ft.; ocean-going vessels can ascend the Sherbro river for 45 miles. Over 7,400 miles of trunk roads are classed as suitable for motoring throughout the year, and there are 650 miles of dry-weather roads. The Government has built and operates over 300 miles of narrow-gauge railway (2 ft. 6 in.). Iron ore is exported from the Marampa mines over a privately owned railway of 3 ft. 6 in. gauge, 57 miles long. Diamonds and chrome ore are also mined on a considerable scale, and other mineral production includes gold. Both industrial diamonds and gems are produced, the latter including some of quite exceptional size from alluvial deposits—one of 530 carats in 1943 and another of 770 carats in 1945. This mineral production, which is largely in the hands of European companies, plays a big part in the commercial wealth of

Sierra Leone, particularly iron ore, of which over 1m. tons were exported in 1951, and diamonds, of which the exports amounted to nearly $\frac{1}{2}$ m. carats. Their value is not stated; it has been customary to omit the values of these two products from the export returns, but complaints of the omission in the House of Commons in 1952 led to a promise that the values would be included in future.

More important to most of the inhabitants are the agricultural resources of the country, as developed by African farmers. Rice is the staple food of the 2m. inhabitants, and paddy is grown on 750,000 acres, yielding 250,000 tons a year. Cassava, sweet potatoes and groundnuts are also grown extensively for home consumption. Commercially, palm kernels are of outstanding importance. In 1951, out of total exports valued at £10·1m., palm kernels provided 75,000 tons valued at over £4 $\frac{1}{2}$ m., and palm oil 3,200 tons valued at over £ $\frac{1}{2}$ m., the two together constituting nearly half the total. Leaving out of account iron ore and diamonds for the reason already stated, there was a big gap between oil palm products and the next most valuable exports—ginger, 3,250 tons valued at a little over £ $\frac{3}{4}$ m.; cocoa, 1,800 tons valued at over £ $\frac{1}{2}$ m.; and piassava, 6,000 tons valued at over £ $\frac{1}{4}$ m. No other commercial product has an export value of £200,000. Imports were valued at £8·2m.

The Gambia Colony and Protectorate compose the smallest British dependency on the mainland of Africa; with an area of some 4,000 square miles, the territory is about half the size of Wales. It has a distinctive character, and may be likened to a mounted thermometer, in which the tube represents 300 miles of the river Gambia, stretching inland at right angles to the coast, and the mount a strip of territory 10 miles wide on either side of the river. The waterway is the main artery of travel; shallow-draught river steamers of some hundreds of tons ply along practically the whole of the British section of the Gambia (the full length of the river is 700 miles), and ocean-going steamers ascend it for 150 miles. There is no railway, and roads are mostly dry-weather tracks. In the rains the upper river rises as much as 30 ft., and there is extensive flooding along the banks.

Just as the river is the dominating physical feature, so there is a dominating product—groundnuts. They constitute all but a trifling percentage of the domestic exports, varying a good deal in quantity from year to year but averaging nearly 60,000 tons of unshelled nuts, with an export value which rose after the Second World War to £1m. and has gone on increasing to £2 $\frac{3}{4}$ m. in 1951. Attempts to develop other major industries have not yet met with success.

As in Sierra Leone, the Colony proper is a collection of comparatively small patches of territory, chiefly at the mouth of the river, where Bathurst, the capital, is built on St. Mary's Island. It has a population of 20,000, and the whole territory contains about $\frac{1}{4}$ m.

people. There is an annual migration, inward and outward, of 'strange farmers', who are an appreciable factor in the agricultural economy of the Gambia. Some 15-16,000 of them come regularly from the neighbouring French territories, grow a crop of ground-nuts by arrangement with the resident farmers, and then return home.

During the Second World War, Bathurst was an important sea-plane base, and at Yundum, 17 miles from the town, it has an air-field which links it with Dakar and Accra, and so with London.

FRENCH WEST AFRICA

French West Africa is not merely a geographical term but the official designation of the largest administrative unit in the whole of Africa: it has an area of 1·8m. square miles—double the size of any other African territory. Over the whole is a Governor-General, responsible for a General Budget, and assisted by a Council in looking after the common interests of eight territories, forming a federation which stretches continuously behind the British West African dependencies and reaches down between them to the sea. The French territories may be divided into two groups. Along the coast, Senegal, French Guinea, the Ivory Coast and Dahomey are four colonies comparable with those of British West Africa. Behind them lie another four territories—Mauritania, which has a stretch of desert coast, and the French Sudan, Upper Volta, and Niger Colony, which are wholly inland. This second group is more than four times as large as the first, but it merges in the Sahara and, except in the Upper Volta, is much more sparsely populated.

In any examination of the resources of a particular territory, care should be taken to ascertain its latest limits. There has been much re-apportionment in the past. An outstanding example is the Upper Volta, which was divided between the Ivory Coast, the French Sudan and the Niger Colony in 1932, but was reconstituted as a separate territory in 1947. The following table gives approximate areas and post-war populations.

Territory	Area : Square Miles	Population
Senegal . . .	81,000	1,992,000
French Guinea . . .	108,000	2,180,000
Ivory Coast . . .	130,000	2,065,000
Dahomey . . .	45,000	1,505,000
	364,000	7,742,000
Mauritania . . .	364,000	518,000
French Sudan . . .	461,000	3,177,000
Upper Volta . . .	122,000	3,069,000
Niger Colony . . .	494,000	2,029,000
	1,441,000	8,793,000
Total . . .	1,805,000	16,535,000

These figures show that French West Africa is between three and four times as large as all the British West African dependencies (which total $\frac{1}{2}$ m. square miles); but its population is little more than half as large, and is much less than that of Nigeria alone. Its geographical characteristics are typically West African. From a low-lying coastal zone, in places covered with tropical forest, elsewhere rich in oil palms, coconut palms and cultivated products, the land rises to open woodlands and savannas, which in turn give place to more or less desert country, merging in the Sahara. The importance of its river systems is partially indicated by the names of three of the territories—Senegal, Niger and Upper Volta. The Senegal river, over 1,000 miles long, lies wholly in French West Africa, forming in the lower half of its course the northern boundary of the colony named after it; crossing, higher up, a corner of the French Sudan; and having its main source in French Guinea, among the highlands of Futa Jallon. These highlands, which rise to 5,000 ft., are not only the main orographical feature of French West Africa, but a notable watershed. As well as the Senegal, here is the source of the Gambia river (700 miles), which flows through French Guinea and the Senegal colony before becoming the artery of British Gambia. Here too, are the sources of the Niger river at the outset of its long journey of 2,600 miles, during which it flows from French Guinea through the French Sudan and thence across the French Niger territory before entering British Nigeria. Both the Black Volta (400 miles) and the White Volta (330 miles) rise in the Upper Volta territory and, with their affluents, water that territory before passing on to the Gold Coast to unite and follow a further course of 310 miles to the sea. These are the dominant rivers of West Africa. Many relatively minor but considerable rivers flow more directly to the coast, and though their passage down the giant steps by which the country descends from the interior plateaus to the sea renders them unnavigable except in stretches, they are an essential factor in maintaining the fertility of the soil.

The value of the trade in francs is many times what it was before the Second World War, but true comparison is made difficult not only by the devaluation of the franc but by the institution, since the war, of an 'African franc' equivalent to two ordinary French francs. This African franc is the monetary unit in all French Africa except North Africa, where the unit is still the franc of metropolitan France, and French Somaliland where the Djibuti franc is equivalent to 1.63 metropolitan francs.

In 1938 the import trade of French West Africa was valued at Frs.1,627m., or, at 170 francs to the £, about £9.5m.; in 1950 the value was African Frs.42,170m., or, at 490 African francs to the £, about £86m. In quantity the imports in 1950 were nearly double those for 1938. Cotton goods are easily the most valuable item (about one-sixth of the whole).

Exports in 1938 were valued at Frs.1,416m. (£8·3m.) and in 1950 at African Frs.30,802m. (£62·9m.). In contrast with this growth in value, quantities in 1950 were actually somewhat below the pre-war standard (nearly 1m. tons), though they were increasing rapidly from the low level of the war years, when shipping difficulties were a limiting factor. Groundnuts are easily the most valuable commercial crop; they are grown on an even greater scale than in Nigeria. In 1950 they provided for export 200,000 tons of unshelled nuts valued at £11·9m., and 70,000 tons of groundnut oil (representing 170,000 tons of nuts) valued at £10·7m., the combined value (£22·6m.) being more than a third of the total. The other principal exports were coffee (£14·6m.), cocoa (£9·6m.), palm kernels and palm oil (£5·5m.), bananas (£2m.), and oil cake (£1·8m.). Altogether these products (including groundnuts) accounted for nearly 90 per cent. of the total exports. More than two-thirds of all the trade is with France, the other chief trading countries being the United States, the United Kingdom and the Gold Coast.

The individual French territories, like the British, have their special characteristics, which are briefly summarised in the following sections.

Senegal, half as large again as England, is the premier colony of French West Africa. A large part of the interior is occupied by a sandy plateau scantily supplied with water, covered with thorn bush, and sparsely populated. But cultivated lands border the Senegal river in the north and extend beyond the narrow strip of British Gambia in the south to the fertile belt known as the Casamance. The coastal zone, too, is productive and carries a fair population. Groundnuts are the outstanding commercial product; Senegal is the chief factor in French West Africa's reputation as one of the leading sources of world supply. Dakar, the seat of the Governor-General, is a town of 175,000 people, a well-equipped port visited by over 3,000 ships annually, and an important centre of air traffic. St. Louis (63,000), the capital of Senegal, near the mouth of the Senegal river, is of little account as a port; access is made difficult by a shifting river bar. But from St. Louis a service of river steamers is maintained to Podor (140 miles) all the year round, and in the flood season (August-September) steamers drawing 14 to 15 ft. of water can ascend as far as Kayes (500 miles), in the French Sudan.

A metre-gauge railway, the oldest in French West Africa, connects Dakar with St. Louis (165 miles). At Thiès, 44 miles east of Dakar, the railway forks: the original line turns north to St. Louis; a later line continues eastward across Senegal into the French Sudan, where it connects with Kayes and eventually reaches its terminus at Koulikoro, on the upper Niger, 800 miles from Dakar.

French Guinea, nearly twice as large as England, has developed on a modest scale commercially. The lowlands yield a wide range of

tropical products, among which the chief exports are palm kernels and palm oil, and bananas, while coffee and tobacco are increasing. The Futa Jallon uplands are the home of an extensive pastoral industry, including 800,000 head of cattle; hides and skins are exported. In the south-eastern extension of the colony, on the borders of Liberia and the Ivory Coast, there is true forest country, but its remoteness has hitherto prevented development of its resources. The mineral wealth of the colony is also imperfectly known and little exploited. Some amount of gold is exported.

Conakry, the capital (39,000), a modern town on an island off the coast, has the only good harbour. From it a metre-gauge railway, 412 miles long, crosses the colony to Kouroussa, limit of navigation on the upper Niger, and Kankan, limit of navigation on its tributary, the Milo.

Ivory Coast. This colony, between two and three times the size of England, provides most of the cocoa and coffee exported from French West Africa. The experiences of the two industries during the Second World War were very different. Previously the Ivory Coast ranked next to the Gold Coast and Nigeria among African sources of cocoa supply, but in the war years its exports declined greatly and afterwards recovered slowly, being surpassed by those of the French Cameroons. On the other hand its exports of coffee—a comparatively new cultivation—increased during the war to such an extent that at the close the Ivory Coast was in the front rank of African coffee-exporting countries.

Palm kernels and palm oil are also important exports. Before the war there was considerable trade in timbers from the forest belt behind the coast, and supplies are capable of great expansion. The coast is surf-bound, and the ports are open roadsteads, but a channel has been cut from the sea to the lagoon behind the coast, and the capital, Abidjan (46,000), which is on the lagoon, has been made a modern deep-water port. A metre-gauge railway to Bobo-Dioulasso (390 miles), in the Upper Volta Territory (p. 700), has been under extension to Ouagadougou, another 256 miles.

Dahomey. Palm kernels and palm oil are the dominant trade factors in Dahomey. It is the smallest of the French West African colonies—smaller than England—but oil palms were planted extensively by the old kings of Abomey between the coast and their capital, about 60 miles inland, and it is estimated that now there are 30m. trees spread over $1\frac{1}{2}$ m. acres. The normal average production is officially put at 55,000 tons of palm kernels and 20,000 tons of palm oil. Before the Second World War, these two products provided over 80 per cent. of the total volume of the export trade. Cotton, shea nuts and shea butter are among the other exports.

Porto Novo, the capital, has a population of 31,000; Cotonu, the chief port, 21,000. The ports are open roadsteads, but Cotonu

has a pier a quarter of a mile long at which shore boats can land or disembark passengers and goods outside the line of surf. Dahomey has 360 miles of metre-gauge railways, including a central line from Cotonu to Parakou (273 miles), which is to be extended eventually to the northern border of the colony at Gaya, on the Niger. Abomey, the ancient capital (15,000), lies just off the central railway, but is connected with it by a line of 60cm.-gauge (approximately 2 ft.). In all there are 69 miles of these narrow-gauge lines.

Mauritania. The character of the greater part of this vast territory—much larger than Senegal, French Guinea, the Ivory Coast and Dahomey put together—is indicated by the fact that the population averages just over one to the square mile. In the south, where the Senegal river divides Mauritania from Senegal, a fertile belt has a settled population, but elsewhere desert or semi-desert country, varied by oases of date palms, is roamed by nomad pastoral tribes in search of grazing and water for their flocks and herds. The herds of cattle and droves of camels and donkeys number hundreds of thousands, and are far exceeded by the flocks of sheep and goats, estimated at 2½m. Livestock are exported to Senegal, and there is a trade in dressed hides and skins. An active sea-fishing industry, to which boats come from the Canary Islands and from Brittany, is based on Port Etienne, which has installations for salting and drying fish for export. A few thousand tons of salt and gum arabic, and about 1,000 tons of dates are exported. The administrative headquarters are not in the territory, but at St. Louis (Senegal).

French Sudan. Mention has already been made (see under Senegal) of the railway connecting Dakar with the French Sudan. From Kayes it mounts the Upper Senegal valley for some distance, then crosses to the Upper Niger at Bamako, and, by-passing a stretch of rapids, descends the Niger Valley to Koulikoro. Upstream from Bamako, the Niger is navigable for 230 miles to Kouroussa, in French Guinea; downstream from Koulikoro it is navigable for 870 miles to beyond Timbuktu and Gao. On both these long stretches a service of river steamers is maintained for about seven months in the year.

Thanks to the inclusion of these sections of the Upper Senegal and Niger valleys, the French Sudan, which is about a fourth larger than Mauritania, has a population six times as large. A wide range of crops includes groundnuts (grown extensively both for local consumption and for export), cotton and sisal. Irrigation works have been carried out along the Niger, in the Segou district. Bamako, the capital, is a town of some 85,000 people, and Kayes, Segou and Sikasso have each from 15,000 to 20,000. Timbuktu, historically the most famous centre as the terminus of caravan routes across the Sahara, now numbers less than 7,000.

Away from the river valleys, to the north, the country assumes more and more a desert character, similar to that of the neighbouring

Mauritania. Agriculture gives place to pastoral industry. Cattle as well as sheep and goats are numbered by the million, and are sold to other colonies for slaughter.

Upper Volta. This reconstituted territory is at once the smallest and most densely populated of the French dependencies carved out of the remote interior of West Africa. It takes in the watershed between the headstreams of the Volta and the right-bank tributaries of the Middle Niger, and is well watered; but its northern situation—it lies north of the Northern Territories of the Gold Coast—gives it a sub-Saharan character, and both agricultural and pastoral industry are carried on. Cattle, sheep and goats each number about $\frac{3}{4}$ m., and live animals and raw hides and skins are among the leading exports. So are groundnuts, shea nuts and shea butter. Cotton is grown, and among the many food crops is rice.

The capital, Ouagadougou, has a population approaching 28,000, but the chief commercial centre is Bobo Dioulasso (52,000), until lately the terminus of the railway from the coast at Abidjan (see under Ivory Coast) and a centre of air and road traffic. The natural outlets for trade are through the Ivory Coast and the Gold Coast, but the Second World War gave an impetus to traffic with Senegal via Bamako.

Niger Colony. Among the territories of French West Africa, only Mauritania is more sparsely populated than the Niger Colony, which extends from Nigeria to Algeria and Libya. The Niger river flows across the south-west corner for 200 miles, and in the south-east the boundary with Nigeria is the lower course of the Komadugu Yobé, a seasonal torrent discharging into Lake Chad. These are the only rivers. North of Nigeria extends a belt of savanna and steppes for roughly 100 miles; beyond stretches the desert, broken by groups of oases of which the most striking is Air, a picturesque country thousands of square miles in extent, dominated by volcanic peaks rising to 5,000 ft.

A variety of crops is grown in the southern belt. Groundnuts are exported in considerable quantities, and there is trade in cotton, gum arabic, dates and salt. Cattle are estimated at $1\frac{1}{2}$ m. head, and sheep and goats at $4\frac{1}{2}$ m. Some 60,000 cattle and 240,000 sheep and goats are exported yearly 'on the hoof', and more than 1m. sheep and goat skins. Caravans numbering several thousand camels are organised in Air to cross the desert for the exchange of products. Niamey (the capital) on the Niger, and Zinder, in the southern belt, north of Kano, are equipped with aerodromes.

FRENCH TRUSTEESHIP TERRITORIES

After the First World War, the former German territories of Togoland and Cameroons were entrusted, under mandate from the League of Nations, to Britain and France, each territory being divided so that a minor western strip went to Britain and the major eastern portion to France. The British strips were incorporated, administratively, in the adjoining British territories (see Gold Coast and Nigeria). The French spheres were placed under separate administrations, headed by a Commissioner (*Commissaire de la République*) in Togoland and a High Commissioner in Cameroons. Since the Second World War, the mandatory Powers have continued to hold these territories as Trustees for the United Nations. The international division of both Togoland and the Cameroons has given rise to much local dissatisfaction.

French Togoland. The French Trusteeship covers a territory of 21,000 square miles (three times the size of Wales) with a population of nearly 1m. Copra, palm kernels and palm oil, cotton and coffee are produced in the south, where a sandy coast fringed with lagoons is backed by a low plateau. The centre is mountainous, with peaks up to 3,300 ft., and is the home of Togoland's cocoa industry. In the north is savanna country, supporting some hundreds of thousands of livestock; elsewhere the pastoral industry is restricted by the tsetse fly. Three lines of railway, totalling 275 miles, start from Lomé, the capital and chief port (population 30,000). One runs along the coast (27 miles); another northward through the centre of the country to Blitta (174 miles), about half-way to the northern frontier; and a third north-west to Palime (74 miles), near the chief coffee-growing area. The coast is surf-bound, and Lomé has an open roadstead, but is equipped with a landing stage extending beyond the surf. In 1950 the exports of French Togoland were valued at £3.1m., the principal items being palm kernels, cocoa, coffee, and groundnuts.

French Cameroons has a comparatively short coastline (about 150 miles) in the angle of the Gulf of Guinea, but widens inland and extends to Lake Chad, a distance of 700–800 miles. It has an area of 167,000 square miles (nearly twice the size of Great Britain), with a population of just over 3m. From a narrow coastal plain the land rises steeply in great steps to a central plateau of 1,500–2,500 ft., carrying here and there mountains up to 7,000 ft., but falling away to the river basins of the interior; the altitude of Lake Chad is under

1,000 ft. The southern third of the territory is a vast primeval forest, opening out to the north in savannas and grassy steppes and semi-desert tracts.

Two railways run inland from Duala, a fine deep-water port at the mouth of one of the feeders of the so-called Cameroons river, really a great estuary into which flow various rivers. One railway, starting from Bonaberi (Duala's subsidiary port, connected with it by ferry), traverses the frontier region bordering the British Cameroons for 100 miles, to Nkongsamba. European enterprise has developed the growing and drying of bananas on a very large scale in this region. The other line runs inland to Yaoundé (190 miles). Duala is the largest town (86,000) and the chief commercial centre, but Yaoundé (40,000) is the capital; it benefits as a place of residence for Europeans by standing on the central plateau, over 2,000 ft. above sea-level. Exports in 1950 were valued at £16·7m., made up largely from cocoa, bananas, palm kernels and palm oil, coffee, timber and rubber.

FRENCH EQUATORIAL AFRICA

This territory, large as it is, may be described as a smaller edition of French West Africa. It extends along the west coast from Spanish Guinea and the Cameroons to the Belgian Congo, where it has for its southern frontier part of the lower Congo river and the Congo's great right-bank tributary, the Ubangi. On the east it has the old Anglo-Egyptian Sudan, on the west the French Cameroons to Lake Chad and thence the Niger Colony of French West Africa, and on the north, Libya. With an area of nearly 1m. square miles it comprises four territories, each with its own Governor and jointly under a Governor-General. Two of these territories, the Gabun and Middle Congo, share the seaboard; the other two, Ubangi and Chad, are wholly inland. There are marked differences in size, but practically none in the density of the population, which in each case is only some 4 or 5 to the square mile. The following table gives particulars of each of the territories.

Territory	Area Square Miles	Population	
		European	African
Gabun	103,000	3,378	405,400
Middle Congo	132,000	9,050	675,400
Ubangi	238,250	4,391	1,067,400
Chad	495,750	3,301	2,238,200
Total	969,000	20,120	4,386,400

The Gabun is the parent colony of this agglomeration of territories; the French have been installed there for over 100 years. Libreville, the capital (population 10,000), founded as a home for

freed slaves in 1849, stands on the shores of the Gabun 'river', which, like the Cameroons 'river', is a great estuary receiving the discharge of a number of streams. A commercial rival to Libreville is Port Gentil (10,000), at the mouth of the Ogowé, a river of 600 miles flowing through the heart of the territory and much in use for the transport of the Gabun's one great commercial product—timber. Almost the whole of the territory—an area larger than Great Britain—is covered with forest, and during the present century an important trade has developed in one species of timber in particular, known by the local name of *okoumé*, a soft, rose-tinged scented wood, which before the First World War was discovered to be especially suited for plywood and found a ready market in Hamburg. Before the Second World War, from 200,000 to 300,000 tons were being sent annually to France and Germany, and during that war Britain became a large buyer.

The Middle Congo also lies, to the extent of half or more of its area, within the limits of the great equatorial forest. It exports a variety of products, including palm kernels and palm oil, and coffee, and boasts the first and so far the only railway in French Equatorial Africa. Leaving the coast at Pointe Noire, near the southern frontier, the line runs inland for 318 miles, in part through very difficult country among the Mayumbe Mountains, to where the Congo river forms the Franco-Belgian frontier. The line reaches the river at Brazzaville, facing Leopoldville (the capital of the Belgian Congo) across Stanley Pool, above the rapids which obstruct the lower river, and at the gateway to long reaches of navigable waterways in the upper Congo basin. Brazzaville (73,000) is both the capital of the Middle Congo territory and the seat of the Governor-General of French Equatorial Africa.

Ubangi, or Ubangi-Shari, is drained by two river systems flowing in opposite directions: the Ubangi, going south and west to the Congo and the Atlantic; the Shari, going north to lose itself in the far interior in Lake Chad. Both rivers rise in a plateau with a water-parting some 2,500 ft. above the sea, falling away to the north and south to little more than half that elevation, but carrying massifs up to 4,500 ft. in the east and west. It is wooded to some extent, but grassland predominates. The past quarter of a century has seen a striking development of cotton-growing, with its attendant ginning industry, and coffee is also doing well. Bangui, the capital, on the Ubangi river, has over 25,000 inhabitants. A railway connecting it with Lake Chad is projected.

The Chad Territory forms fully half of French Equatorial Africa. It includes the greater part of the Shari basin and much of Lake Chad, which it shares with the Cameroons, Nigeria, and French West Africa. Northward it extends to the Libyan Desert, rising in the north-east to the Ennedi plateau (4,500 ft.) and the Tibesti highlands

(13,000 ft.). This northern half of the territory does not lend itself to agricultural industry, except for the cultivation of the date palm in the oases, among which Borkou is especially noted for its dates. The nomad tribes follow pastoral pursuits, and the territory as a whole is credited with 1m. cattle and 2m. sheep and goats. The position in the Shari basin is different. Here, as in Ubangi, cotton-growing has developed on a considerable scale, along with cotton ginning; and groundnuts are also extensively cultivated. The capital is Fort Lamy, on the lower Shari, where it is joined by its big tributary, the Logone.

General. The economic development of French Equatorial Africa has been hampered by the remoteness of large parts of it, difficulties of access, slow and costly transport, the prevalence of the tsetse fly, and—not least—the sparseness of the population. Exports in 1950 were valued at £16·1m., the chief items being ginned cotton, timber, coffee, palm kernels and palm oil, gold, lead, diamonds, and raw hides and skins.

LIBERIA AND SPANISH GUINEA

Wedged into the great mass of French West and Equatorial Africa are not only the British and former German possessions but three single territories—Portuguese Guinea (see page 709), Liberia, and Spanish Guinea.

Liberia is unique in Africa as a negro republic founded by American philanthropists as a home for freed American slaves (cf. Freetown, page 692) and constituted an independent State in 1847. It lies between Sierra Leone and the two French territories of Guinea and the Ivory Coast. The freed slaves have tended to become an educated dominant caste at variance with the local tribes, and the country is very backward. It has an area of 43,000 square miles—a little smaller than England—and the total population is estimated at 1½m. Much of the country is dense forest, thinning out to savannas as the land rises in the interior. There are few roads and no railways. The coast is surf-bound and without natural harbours, but harbour works are being carried out at the capital, Monrovia (estimated population 20,000), on American lend-lease terms, introduced during the Second World War in connection with the grant of Liberian air bases to the United States. The unit of currency is the American dollar, and in various ways the United States is trying to put the affairs of Liberia on a sound basis. The country has great potential resources. It is rich in oil palms, and is the home of a hardy type of coffee, *C. liberica*, now widespread elsewhere as *C. robusta*. The Firestone Plantation Company has planted large

rubber estates, and in 1950 rubber provided 85 per cent. of exports valued at £6·3m. Marshall, near the plantations, is the chief port of despatch.

Spanish Guinea comprises a mainland territory, Rio Muni, wedged between the Cameroons and the Gabun colony of French Equatorial Africa; and a few scattered islands, of which Fernando Po, about 100 miles N.N.W., is by far the most important. The mainland territory, covering just over 10,000 square miles (one third larger than Wales), takes its name from an inlet on its southern border which, like the Cameroons and the Gabun 'rivers', is less a river than an estuary receiving the discharge of several rivers. It is typically West African, rising by steps from a coastal zone of virgin tropical forest, which gradually gives place to grassy tracts on the plateaus. In the Crystal Mountains heights of 4,000 ft. are reached. Returns of the population give a figure of nearly 140,000, but that of Bata, the chief town and port, is only about 1,000, and in general the country awaits development.

The Governor has his headquarters on Fernando Po, which, with an area of 800 square miles (about the size of Westmorland), is famed for its tropical luxuriance and mountain grandeur. Like the Cameroons Mountain (over 13,000 ft.) on the mainland, facing it across 20 miles of sea, Fernando Po is of volcanic origin, and though it is not so high, the culminating peak, Santa Isabel, rises to over 9,000 ft. The population is 34,000, of whom half or more live in or around the capital, Santa Isabel, beautifully situated on lofty cliffs and connected by a cog-wheel railway with a remarkable natural harbour, originally a deep crater. The island abounds in tropical products, among which cocoa is extensively grown for export (12,000–14,000 tons annually). Another substantial export is coffee (3,000–4,000 tons).

BELGIAN CONGO

Founded as the Congo Free State by King Leopold II of Belgium in his individual capacity, recognised by the Powers at the Berlin Conference in 1885 as a philanthropic enterprise under his personal sovereignty, but afterwards severely criticized in respect of the administration, this vast territory was taken over by Belgium in 1909, the year of the King's death, and has since gained a much better reputation. It includes all the Congo basin save some subsidiary streams on the outskirts, and with an area of 900,000 square miles is comparable in size with the old Anglo-Egyptian Sudan and with French Equatorial Africa. It is less sparsely populated than either of them, the number of its inhabitants being 11·4m. There is a Governor-General, with six Provincial Governors.

The northern part of the country is covered with primeval forest, opening out in the south to park-like country. Much of the Congo basin is below 1,000 ft., but the headstreams flowing from distant plateaus are often unnavigable, and even along the middle and lower courses there are occasional tracts through which the rivers have to break their way in a series of rapids. In general, however, the territory is not notably mountainous, except along the eastern border, which contains Ruwenzori (16,800 ft.) and the Mfumbiro volcanic area (14,800 ft.) north of Lake Kivu. There are long navigable stretches between the rapids both on the main river and its tributaries, of which the two outstanding are the Kasai (left bank) and the Ubangi (right bank). The total length of waterways navigated by steamers is about 7,500 miles, or two and a half times the total length of the Congo (2,900 miles). Barges up to 350 tons ply on nearly 5,700 miles of river, and up to 1,200 tons on over 1,600 miles. Altogether there are some 1,300 river steamers, totalling over 200,000 tons. Through transport on the main river is facilitated by railways (metre-gauge) which have been built round the rapids.

Though it can claim to be a maritime State, the Belgian Congo could scarcely have a shorter seaboard. Portuguese West Africa (Angola) extends up to the south bank of the mouth of the Congo river, and north of the river mouth there is an isolated patch of Portuguese territory which occupies the coast right up to French Equatorial Africa. Just at the river mouth, on the north side, the Congo State has a few miles of coast, with the small seaport of Banana. Upriver is another small port, Boma, terminus of a narrow gauge railway for the export of timber, and beyond that is the chief port, Matadi, where the European steamers discharge and load their cargoes. It is about 90 miles from the open sea and is the limit of navigation for ocean-going vessels. Above it, for over 200 miles, the course of the Congo is broken by a series of falls as the river forces its way through the Crystal Mountains. The falls are circumvented by a metre-gauge railway (227 miles) connecting Matadi with Leopoldville, the capital, on Stanley Pool. The two places are also connected by a pipeline of 4 in. diameter, through which fuel oil is pumped for use by the steamers on the upper river. Above Leopoldville the Congo, sometimes miles wide, is navigable for over 1,000 miles, up to Stanleyville. There a railway of 78 miles circumvents the Stanley Falls and connects at Ponthierville with another navigable section of the river (now known as the Lualaba) extending upstream to Kindu. From Kindu another railway (275 miles) mounts the valley to Kabalo, and then strikes across country for 170 miles to Albertville, on the Belgian shore of Lake Tanganyika, a notable connection because from Kigoma, on the opposite (British) side of the lake, the Tanganyika Central Railway gives access to the East African coast at Dar-es-Salaam.

Above Kabalo the Lualaba is navigable to Bukama, once the terminus of the through railway from Cape Town (2,590 miles). From the Copperbelt of Northern Rhodesia this line enters the Belgian Congo at Sakania and continues via Elisabethville, the provincial capital, through the highly mineralised region of Katanga, the Belgian counterpart of the British Copperbelt. The wealth of the joint production, actual and potential, has been a strong incentive to develop communications with the outside world. The rail service to the south not only links Katanga with Cape Town (2,305 miles from Elisabethville), but, more important commercially, provides connection with the East Coast port of Beira (1,619 miles). Northward the rail service now extends 698 miles beyond Bukama to Port Francqui, on the Kasai (983 miles from Elisabethville), so that there is through communication by rail from Cape Town northwards into the heart of the Congo basin for a distance of 3,288 miles. Further extension of the line to Leopoldville, the Belgian capital, is contemplated; already there is connection by motor road, coming from Katanga. Meanwhile there is transport by river steamer from Port Francqui down the Kasai and the Congo to Leopoldville (6 days) and from there by rail (227 miles) to Matadi and its ocean-going steamers.

Another outlet from Katanga lies through Portuguese West Africa. A line branches off from Tenke, 176 miles beyond Elisabethville, runs for 323 miles to the south-west corner of the Belgian Congo, and continues through Portuguese territory for 835 miles to the coast at Benguela and Lobito Bay—a total journey from Elisabethville of 1,334 miles, covered in three days. Incidentally this service, coupled with the further service from Elisabethville to Beira, provides through railway communication across Africa from west to east.

Air services connect the principal centres within the Belgian Congo, and maintain communications with other African countries and with Europe.

Katanga is not the only source of mineral wealth in the Belgian Congo, nor is copper the only mineral product of Katanga; but copper is easily the biggest factor in the mineral production. In 1938 the output was 124,000 metric tons; during the war it went up to 166,000 tons, and after a subsequent falling off it rose in 1951 to a peak figure of 192,000 tons. The industry is controlled by the Union Minière du Haut Katanga, which has large smelting works in the region. Other minerals worked include tin, cobalt, and zinc. Uranium ores are sent to Belgium for the extraction of radium. Outside Katanga are extensive deposits of diamonds on the upper Kasai, a continuation of the neighbouring Portuguese diamond fields. The annual output in the Belgian Congo ranges from 5m. to 10m. carats. Gold is mined in various districts, chiefly at the Kilo

mines in the far north-east, to the west of Lake Albert. The annual production is from 10 to 15 metric tons.

The oil palm grows wild throughout the territory at the lower levels, and its crop of fruits has long been collected by the natives. Since the First World War a big impetus has been given to the oil palm industry by the cultivation of the trees in large plantations by European companies, notably the Huileries du Congo Belge (Unilever), who not only grow and buy enormous quantities of oil palm fruits but extract the palm oil from the pericarp (the outer fleshy part of the fruit) in up-to-date factories. Palm kernel oil, a different product, is not as a rule extracted locally except for local use; commercially, the kernels are exported and their oil is extracted in the importing countries. Before the Second World War the export of palm kernels from the Belgian Congo exceeded the export of palm oil (94,000 tons in 1937 against 68,000 tons); but during the war palm oil took the lead.

Cotton is also grown on a large scale, the area under cultivation in the years 1937 to 1950 varying from $\frac{3}{4}$ m. to nearly 1m. acres, and the production from 68m. to 104m. lb. There is a considerable coffee crop, and the production of rubber revived during the war. Live-stock do not thrive except on the higher lands—the plateau of Upper Katanga, rising to over 5,000 ft., and the eastern borderlands. Indeed, the only region where pastoral industry is practised on a big scale is Ruanda-Urundi, the north-east corner of the old German East Africa, for which Belgium is trustee. This highland country, bordering on Lake Kivu and the northern end of Lake Tanganyika, is nearly three times the size of Wales, and is one of the most densely populated districts of Africa—nearly 200 to the square mile. It is estimated that there are in Ruanda-Urundi 1m. head of cattle and over $1\frac{1}{2}$ m. sheep and goats.

Contrary to the experience of some other African territories, the Second World War saw an increase in the exports from the Belgian Congo in quantity as well as in value. In 1936–38 they averaged 522,541 metric tons valued at 1,958m. francs, or, at 176 francs to the £, over £11m. In 1947 the quantity was nearly 50 per cent. more (756,954 metric tons) and the value nearly 300 per cent. more (£43·46m.). Further increases in volume brought the value to £136·5m. in 1951. Copper contributed one-fourth (£33·9m.) of the exports in 1951, tin £12·8m., diamonds £4·2m. and other minerals £11·7m., these items amounting to nearly half the total. Vegetable oils and fats contributed £22·2m., cotton £15m., coffee £12·2m., cabbage-palm nuts £6m. and raw rubber £5m., making together almost as much as the minerals.

Imports in 1947 amounted to 563,133 metric tons valued at £34·4m.—nearly double the quantity before the war, and over six times the value. By 1951 the value had gone up to £108·3m.

An important factor in the development of the Belgian Congo has been its inclusion in the Free Trade Zone established by the Congo Basin Treaty, into which the Powers entered at the Berlin Conference in 1885. See page 630.

PORTUGUESE AFRICA

Portuguese Africa falls into two main divisions—Angola, or Portuguese West Africa, and Mozambique, or Portuguese East Africa. In addition to various outlying islands (see under African Islands, page 717), there is a third mainland territory, comparatively small and seldom heard of. This is **Portuguese Guinea**, an enclave in French West Africa, shut in by French Guinea and the Casamance strip of Senegal, south of the Gambia. It has an area of 14,000 square miles (nearly twice the size of Wales), and, for Africa, a relatively dense population of 517,249 (37 to the square mile). The coast is much indented, and Bussao, the little capital and chief port has a harbour capable of accommodating the largest vessels. The country is low-lying, attaining only to some 600 ft. in the south-east, and is the northern limit of cultivation of the oil palm. Normally 12,000–14,000 tons of palm kernels are exported and 1,000 tons of palm oil. Groundnuts are also extensively grown, exports averaging about 30,000 tons of unshelled nuts. These are the main items in the exports, which in 1949 had a total value of £2m.

Stretching along the coast between the Belgian Congo and South-West Africa, a distance of over 1,000 miles, **Angola** partakes in the north of the tropical luxuriance of the one, and in the south of the aridity of the other. Inland it forms the entire western border of Northern Rhodesia. It is one of the bigger African territories, with an area of 481,000 square miles (rather more than half the size of the Belgian Congo), and a population in 1950 of over 4m. (between 8 and 9 to the square mile), including 51,000 whites. The coast itself is generally low-lying and dry. The westerly winds, cooled by their passage over the cold Benguela current, do not bring rain to the territory till they strike the high country inland. Along the northern half of the coast the rainfall is sufficient (12 inches at Luanda, the old St. Paul de Loanda) to maintain open savannas, on which the palm oil is a characteristic tree. Farther south the vegetation thins out, with welcome oases in the river estuaries, till in the far south the annual rainfall is not more than an inch, and desert conditions prevail.

Behind the coast the country rises rapidly, in the north by escarpments which catch the rainfall and are covered with tropical forest, in the south through rugged belts of 'Thirst Country'. The ascent leads

to a central plateau, ranging from 3,500 ft. to 6,000 ft. in the south, but averaging much lower levels in the north (rarely above 3,000 ft.), while eastward it dips down to the Congo and Zambezi river basins. Food crops grown by the natives include maize, beans and manioc. Both companies and individuals have developed extensive plantations of coffee, oil palms, sisal and cotton, with post-war crops considerably in excess of pre-war. At the higher levels the plateau has attracted a considerable number of white settlers, who are engaged in ranching and mixed farming. Rolling tracts of open woodlands and grassy plains are diversified by deciduous forests. This upland country is well watered, for the most part, by rivers flowing not only westward to the Atlantic Ocean (notably the Cuanza and Cunene) but northwards to the Kasai and eastwards to the Zambezi. It is indeed a vast watershed, reaching in its highest points levels of 8,000-9,000 ft. The Challa Mountains in the south-west, where the great scarp at the back of Mossamedes is particularly imposing, rise to over 7,000 ft.

Four lines of railway from as many points on the coast have been built inland to assist in opening up the country and marketing its produce, as well as, in one case, to facilitate communications with the copper fields of Katanga and Northern Rhodesia. These lines are separate enterprises, and are not of uniform gauge. The most northerly (metre gauge) runs from Luanda eastward for 280 miles to Malange (3,000 ft.). Luanda, founded in 1575 and capital of the colony since 1927, is by far the largest town (67,000 including 10,000 whites). It comprises a lower and an upper town (150 ft. above the sea) and has a deep-water harbour protected by an outlying island. Till lately, vessels have had to anchor in the roadstead, but new port works include over half-a-mile of quays, mostly with a depth of 35 ft. of water alongside.

The most southerly line, the Mossamedes Railway, is of 2 ft. gauge. Starting from the little old town from which it takes its name, which has an open roadstead for port, it climbs the arid scarp of the Challa range to the Huila Plateau, where its terminus is Lubanga, 155 miles from Mossamedes. Fifteen miles beyond, at Humpata, some 6,000 ft. above sea level, a large party of Boers settled in 1876 and remained for half-a-century, when most of them moved into South-West Africa with the help of the Union Government.

In between these two railways is a third, running 62 miles inland from Porto Amboim to hilly country, but stopping short of the final ascent to a plantation area where coffee and oil palms do particularly well. This little line was built on the 2 ft. gauge, but when war broke out in 1939 steps were being taken to convert it to metre gauge.

Of far greater importance than these lines, useful as they are, is the Benguela Railway, which is on the standard South African gauge (3 ft. 6 in.) and has a length of 835 miles in Angola, beyond which it

extends through the Belgian Congo to Katanga (see page 707) and links up with the Rhodesian railways, incidentally providing railway communication right across the continent to Beira, in Portuguese East Africa, a through journey of 2,953 miles. At the Angola end the line actually starts from Lobito Bay, some 22 miles north of Benguela. The bay is formed by a sandspit 3 miles long and 400 yds. wide, joined to the land but running parallel to the coast, enclosing an expanse of sheltered deep water nearly a mile across, constituting easily the best harbour in the territory. It has been equipped as a modern port, and the town which has sprung up on the sandspit already has a population of about 20,000. It has a pipe-borne water supply from the Catumbela river, 8 miles away, and electric light and power from the same source. At Benguela—one of the oldest of the Portuguese settlements and slave marts, but with only an open roadstead, and now outstripped by Lobito in both size and trade—the line turns inland and mounts by degrees to the central plateau, where it reaches heights of 6,000 ft. At mile 248 is Vila Robert Williams, the old Caala, re-named in honour of Sir Robert Williams, whose enterprise and energy carried the railway to completion in face of many difficulties; and at mile 266 is New Lisbon, the old Huamba, the most important inland town in Angola: a great road centre, home of the main railway repair shops, and since 1928, when the name was changed, the capital-designate of the territory; though so far (1953) the transfer from Luanda has still to be effected. Towards the Congo frontier the line descends, and at the frontier station it is down to 3,600 ft.

As Portugal remained neutral in the Second World War, her colonies were less affected than some parts of Africa. Angola's exports increased even in quantity, while they nearly trebled in value in the ten years 1938–47. The Angolan unit of currency since 1928 has been the Angolar, equal to the Portuguese escudo, and at the exchange rate of Esc.80·5 to the £ the territory's exports in 1950 amounted to £26m. The two main items were coffee and diamonds, and among many others were palm oil and palm kernels, cotton, sisal, maize, sugar, dried and salted fish products, beans, wax, castor seed, and raw dressed leather. The livestock resources of the territory include over 1m. head of cattle and over $\frac{1}{2}$ m. sheep and goats.

Mozambique is smaller than Angola and much less compact, but is also less sparsely populated. With an area of about 300,000 square miles and over 5 $\frac{3}{4}$ m. inhabitants (19 to the square mile), it extends along the coast through over 16 degrees of latitude and straggles backward and forward inland in very irregular fashion. The southern districts, north of Natal, are confined between the coast and Swaziland in a strip about 50 miles wide. In the north, between the coast and Lake Nyasa, the width is some 400 miles.

Along the Zambezi, which bisects the territory, it follows the course of the river for nearly 700 miles, pushing a Portuguese wedge between Southern and Northern Rhodesia. On the other hand, the extension of British Nyasaland south of Lake Nyasa nearly to the Zambezi thrusts a wedge of alien territory into the heart of Mozambique.

South of the Zambezi the erratic width is largely due to the varying depth of the coastal belt; for this half of Mozambique has been described as 'a Portuguese foreshore to the British South African hinterland'. It runs back to the escarpment which bounds the Southern Rhodesian plateau, but south of the Zambezi it is only in the north-west that Mozambique trenches on upland country to any considerable extent, and there the elevation is only up to 3,000 ft., except in the Gorongosa mountain group (6,300 ft.). North of the Zambezi the territory reaches back to and includes the plateau bordering the south-east shore of Lake Nyasa. Here too the general level does not exceed 3,000 ft., but there are highland tracts up to 5,000 ft., and occasional hills of which the highest, the Namuli massif, rises to 8,000 ft.

Portugal's interest in this region goes back to Vasco da Gama's famous voyage to India in 1498, when the navigator touched at Mozambique island. A settlement was formed there in 1504, and a massive fort erected which has kept the Portuguese flag flying through all the vicissitudes of the national fortunes in the Indian Ocean during the succeeding 4½ centuries. Other settlements were formed, but Mozambique held the pre-eminence. Its position corresponds, in some ways, with that of Mombasa island, and though it is farther from the coast (about 3 miles), the channel provides a sheltered harbour which is still a centre for the coasting trade. The town retains many of the features of early Portuguese settlement, and as a survival from those days is perhaps unequalled in East Africa; but it has not kept pace with modern developments, and not only had to give way in 1907 to Lourenço Marques as the capital city of Portuguese East Africa, but has been outstripped commercially by the port of Beira also.

The rise of these last two places is significant of a prime factor in the modern importance of Portuguese East Africa. The territory has wealth of its own, chiefly in plantation products, but benefits greatly by owning short approaches, from the side of the Indian Ocean, to such go-ahead and flourishing countries as the Transvaal and Southern Rhodesia. The transit trade with them, and with Northern Rhodesia and even Katanga, has given a stimulus to railway construction in Portuguese territory and to the provision of modern port facilities. Both Lourenço Marques and Beira owe their progress in the present century largely to these circumstances. In other respects they are very different. Lourenço Marques was founded in 1544 on the inner side of Delagoa Bay, which forms a magnificent natural

harbour, but the site was unhealthy and there were other troubles to hamper development. The settlement was not given municipal rank till 1887, and its big advance dates from 1895, when it was linked by railway with the Transvaal. The transformation since then has been remarkable, not only in respect of trade development and port administration, but in the town itself, which sanitary reforms and other improvements have turned into an up-to-date seaside resort, much patronized by week-end and other visitors from Johannesburg and elsewhere. The close ties between South Africa and Portuguese East Africa are further shown by the inclusion of the latter in the South African Postal Union, and by the Mozambique Convention, which provides for the recruitment of labour in Mozambique for the South African mines, the free exchange of the products of the two countries, and the apportionment to Lourenço Marques of certain ocean traffic. Apart from the railway to the Transvaal, of which 58 miles lie in Portuguese territory, Lourenço Marques is the terminus of lines to Goba (43 miles), near the Swaziland border, and Guija (165 miles) on the Limpopo River. Its population is over 70,000, including 16,000 whites.

Beira (15,000), at the mouth of the Pungwe and Busi rivers, south of the Zambezi, was unknown till nearly the end of last century. It came into prominence as the coastal terminus of the Beira Railway, which crosses the coastal plain and ascends the escarpment to join the Rhodesian railway system at the frontier (196 miles). The line was built while all that part of Mozambique was held under charter by the Mozambique Company. It was the Portuguese policy to grant concessions to companies of varied standing. The Mozambique Company was comparable with the British Chartered Companies; some of the capital was British, it had close relations with the Rhodesian Railways, and an office in London as well as in Lisbon. The country it administered, extending from the Zambezi to the 22nd parallel of South latitude, was larger than England. With the development of local resources went the development of Beira as 'The Gateway to Rhodesia', resulting in traffic facilities and a volume of trade, direct and indirect, not to have been achieved otherwise. Nor was this all. From being 'The Gateway to Rhodesia' Beira went on to become also 'The Gateway to Nyasaland'. British railways had been built in the Shiré valley to circumvent the cataracts and other obstacles to through navigation on the Shiré, in its course from Lake Nyasa to the Zambezi. But Nyasaland has no outlet of its own to the sea, and its railways were handicapped till in 1922 a line from Beira, 175 miles long, reached the southern bank of the Zambezi opposite to the terminus on the north bank. The bridging of the Zambezi was a formidable problem, and before it was solved some realignment of the railway was necessary on both sides of the river. The bridge—finally built near Sena, a famous centre of the

sugar industry—was opened for traffic in January 1935. It is 200 miles from Beira and is the longest bridge in the world (over 2 miles).

The Mozambique Company's charter expired in 1942. It was the last to survive, and the whole territory is now under the direct administration of the Government. In addition to the completed railways a line is being built to Lake Nyasa from Lumbo, a mainland harbour opposite to Mozambique island; and another line up the Zambezi valley, on the north side of the river, from the Zambezi bridge to a coalfield near Tete.

Portuguese East Africa's domestic exports, as distinct from the trade which passes through it in transit, increased in value from £4.22m. in 1938 to £15.2m. in 1950, the chief items being cotton, sugar, copra, timber, cashew nuts, sisal, oil seeds and bananas.

OUTLYING AFRICAN ISLANDS

BRITISH

Zanzibar (see page 684) and various minor islands around Africa are intimately related to the mainland. The only outlying British island of notable commercial importance is **Mauritius**. It lies 500 miles east of Madagascar, is of volcanic origin, and covers 720 square miles—the size of Surrey. Seaward it is ringed by coral reefs; inland it rises to a central plateau of 1,000–2,000 ft., fringed with peaks up to 2,700 ft. It is a picturesque, well-watered, fertile island, supporting a population of 475,000, the average density (660 to the square mile) being nearly equal to that of England and Wales. Port Louis, the capital, has a population of 76,000. Mauritius might be a Garden of Eden but for one great drawback—it is subject to devastating cyclones.

Industry and trade centre in a single product—sugar. No other British colony produces so much cane sugar, and in the Commonwealth only Australia rivals its exports of sugar. Quantities vary largely from year to year. In 1945, when three cyclones struck the island, the crop was 138,000 tons; in 1948–51 the average was more than 450,000 tons. Sugar accounts for 97 or 98 per cent. of the domestic exports. In 1938 the export value of 288,000 tons was nearly £2.5m.; in 1950, 359,000 tons were valued for export at nearly £10.7m. Out of 170,000 acres under cultivation about 133,000 acres (nearly 80 per cent.) are under sugar; and of the sugar crop about 80 per cent. is produced on some 200 large estates, the balance being the output of nearly 15,000 small planters. A successful ancillary industry, started during the 1939–45 war, is the manufacture of sugar bags from aloe fibre; they have replaced the gunny bags previously imported from India. Tea cultivation offers promising

prospects, and is attracting Government attention. Less than 10 per cent. of the colony's food requirements are grown locally.

Captured during the Napoleonic wars, when it bore the name Ile de France, Mauritius is still largely French in character, especially among the planter class; but the introduction of Indian coolie labour to work the sugar estates has been such that two-thirds of the population is now Indian. The colony includes a number of dependencies, islands smaller and more remote than Mauritius, the chief one being Rodriguez, 350 miles farther east. It has an area of 42 square miles (about the size of Jersey) and is the home of peasant proprietors.

The Seychelles and their dependencies, a numerous and widely scattered group of small islands north of Madagascar and south of the Equator, became British at the same time as Mauritius, of which they were a dependency. Since 1903 they have been a separate colony. The total area is 156 square miles (double that of the Channel Islands). The Seychelles proper are in about the latitude of Mombasa, and tentative approaches have been made to the Kenya Government with a view to the incorporation of the colony in Kenya. The main island, Mahé (55 square miles; 30,000 inhabitants), comprises most of the population and is the seat of the capital and chief port, Victoria. It is mountainous (3,000 ft.) and exports copra, guano, essential oils, vanilla, &c., to the value (1950) of over £½m. Distinctive products of the colony as a whole are coco-de-mer (a double coconut) and the giant tortoise, whose special habitat is the Aldabra group.

On the other side of the Equator, far to the north, about 150 miles off the Horn of Africa, is **Socotra**. The island belongs to one of the Sultanates of the Aden Protectorate, and has an area of 1,400 square miles and a population of 12,000; it is rich in livestock, date palms, and gums, including the noted Dragon's Blood.

On the opposite side of Africa, in the South Atlantic, 1,200 miles from the west coast and 1,695 miles from Cape Town, is **St. Helena** (47 square miles, 5,000 inhabitants), an island little larger than Jersey, but rising within that narrow compass to 2,700 ft. Famous historically as the final place of exile of the Emperor Napoleon, and once an important place of call on the long sea voyage to India, it has sunk into comparative insignificance since the opening of the Suez Canal. It is still an occasional port of call, and its people eke out a meagre livelihood by selling specimens of their handicrafts to passengers. An industry of some little magnitude, supporting half a dozen small mills, is the cultivation and processing of New Zealand 'flax' (see page 152). In 1951 the total exports were valued at £215,000. Practically all the trade is with the United Kingdom. The capital is Jamestown (1,500).

Between the two world wars St. Helena was given two remote dependencies—**Ascension Island** (34 square miles), 700 miles to the

north-west, and Tristan da Cunha, 1,500 miles to the south-west. The former, mostly a waste of volcanic cinders, but redeemed from complete barrenness by the upper slopes of Green Mountain (2,800 ft.), has importance as a cable station and by virtue of its position in mid-Atlantic, about half way between Brazil and the west coast of Africa. In the Second World War it was used as a re-fuelling base by the American air-transport service. Large numbers of turtles are caught on the island between December and May.

Tristan da Cunha, one of the loneliest and bleakest of outposts, an extinct volcano rising 7,640 ft. from the sea, was garrisoned during Napoleon's exile on St. Helena, and is inhabited by the descendants (200-300) of a party of men and women who elected to stay when the garrison was withdrawn. They have been barely able to support themselves, and the island—or rather islands, for there is a group of four, though only Tristan is inhabited—remained of negligible importance till the Second World War. Then a meteorological station was established, based on South Africa. After the war an Administrator was appointed, and a South African company started a fish-canning industry. The manager and a chaplain who is maintained on Tristan are ex-officio members of an Island Council with ten elected members, presided over by the Administrator.

FRENCH

Madagascar came under French influence in the seventeenth-century and was recognised by Britain as a French protectorate in 1890. At the outcome of hostilities before and after the latter date, the native (Hova) dynasty was suppressed in 1896. Nearly 1,000 miles long and with an area of 228,000 square miles (rather more than that of France), Madagascar is the only African island comparable in size with the mainland territories. Its population is over $4\frac{1}{2}$ m., an average of about 19 to the square mile. Much of the interior is occupied by a plateau, averaging some 4,000 ft. above sea level and carrying mountains up to over 9,000 ft. The east coast is lined for hundreds of miles with lagoons, beyond which the land rises sharply to the central plateau. The descent on the other side is more gradual, and extensive plains border the Mozambique Channel, which separates the island from Portuguese East Africa (Mozambique). The channel is wide and deep: 240 miles across at its narrowest, and having a depth below sea level as great as the height of the mountains above it. But Madagascar ranks definitely as an African island, linked with the continent by land in past geological ages.

Antananarivo, the capital, seat of the Governor-General and by far the largest city (174,000), is situated on a ridge of the central plateau at a height of 4,250 ft. Tamatave (29,000), on the east coast, is the principal port; over a quarter of the trade of the island passes through it. Among other ports are Majunga (32,000), on the west

coast; Diego Suarez (24,000), in the north; and Fort Dauphin (10,000), in the south. On the plateau, south of Antananarivo, are Antsirabe (15,000), noted for its thermal springs, and Fianarantsoa (18,000), seat of the Governor of the South. A metre-gauge railway connects the capital with Tamatave (229 miles) and sends out a northern branch (105 miles) to Lake Alaotra. Another line from Antananarivo runs south to Antsirabe (99 miles). Fianarantsoa, the southern capital, is connected by railway with the east coast at Manakara (101 miles). In all there are 534 miles of railway, carrying normally a million passengers and 300,000 tons of merchandise a year.

Trade is based on both agricultural and pastoral industry. Rice, the staple food crop, is grown on over $1\frac{1}{2}$ m. acres. Cattle are estimated at 6m., and there are big meat factories. The exports of coffee in 1950 were valued at £13.5m., more than half the total exports of £25.4m. Other commodities produced for export are vanilla, raw hides, tinned meat, cloves, essential oils (for perfumery), manioc (for tapioca), sugar, graphite, and mica. Processing works and manufacturing include tanneries, a shoe factory, soap works, a sugar factory, and rum distilleries.

The **Comoro Islands**, a volcanic group at the northern end of the Mozambique Channel, are a dependency of Madagascar. Including Mayotte they cover nearly 800 square miles (rather less than the combined areas of the Orkney and Shetland Isles) and have a population of about 169,000. Plantation products include vanilla, sugar, cocoa, and raw materials of perfumery (citronella, patchouli, &c.). Also ranking as dependencies of Madagascar are the scattered French islands in the south of the Indian Ocean—*Amsterdam*, *St. Paul*, *Kerguelen*, *Crozet*—used as whaling and fishing stations, and the Antarctic *Adélie Land*, south of Australia.

Réunion, a French colony since the seventeenth century, given the status of a Department of France on January 1, 1947, is between 400 and 500 miles east of Madagascar, on the way to Mauritius. It is volcanic, with an area of 970 square miles (about the size of Dorset). Opposite peaks of 8,600 ft. and 10,600 ft. are connected by a plateau. The population of about $\frac{1}{2}$ m. includes four towns—St. Denis (the capital), St. Louis, St. Pierre and St. Paul—each with from 20,000 to 40,000 inhabitants. Exports in 1950 were valued at £6.9m., to which the chief contributories were sugar and rum, the balance being provided mostly by essential oils and vanilla. The production of sugar was over 100,000 tons, and of rum 1.7 m. gallons.

PORTUGUESE

Madeira (270 square miles: nearly twice the size of the Isle of Wight) is the principal island of a small group (total area 308 square miles) to the west of Morocco. Only one of the other islands is

inhabited—Porto Santo (16 square miles; population 3,000). Madeira lies 340 miles from Cape Juby, and its capital, Funchal, is a regular port of call for the mail steamers between Southampton and Cape Town. The island, which is administered as a province of Portugal, had a population of 266,000 at the 1950 census—a much denser population than that of the Isle of Wight. About a third of the number live in and around Funchal.

Madeira is of volcanic origin, rugged and mountainous, rising in its highest peak to over 6,000 ft.; but the soil is fertile and there is a rich flora, though little evidence remains of the forests which gave the island its name (*madeira*, Portuguese for *wood*). Commercially the name now stands for the wines produced in the island from vineyards which largely took the place of sugar plantations after the abolition of the slave trade, and which in turn suffered from devastating attacks, first of a fungoid disease and then of the dread insect pest, phylloxera, which took ten years to exterminate. Bananas enter largely into the export trade in fruit and vegetables. Embroidery and wicker furniture, the product of local handicrafts, are other leading exports, while the tourist traffic, based on Madeira's attractions as a health resort, provides an invisible export of the first importance.

Cape Verde Islands. This group, situated some 300–400 miles west of Cape Verde, comprises ten islands and a few islets, with a total area of some 1,500 square miles (about half as large again as the Orkneys and Shetlands), the largest, São Thiago (355 square miles), being about the size of Pomona, the largest of the Orkneys. The islands are volcanic, with peaks ranging up to 9,000 ft.; and, coming under the influence of the harmattan winds from the Sahara, they partake of the nature of the desert, supporting little vegetation except in the river valleys. The population (150,000) is beyond the economic capacity of the group, and normally there is a seasonal migration of labour to South America, with the striking consequence, thanks to the earnings of the men, that the value of the imports is many times the value of the exports. These last include castor oil seed, coffee, and brandy, the coffee having the reputation of being especially rich in caffeine. But the chief commercial importance of the group lies in its coal and oil fuelling station for ships at Porto Grande, on São Vicente, which is largely used by vessels engaged in the South American trade.

São Thomé and Príncipe (St. Thomas and Prince's) are two islands in the Gulf of Guinea, 150–180 miles from the mainland, the first immediately north of the Equator, the other about 90 miles farther north. They are smaller editions of Fernando Po, and their luxuriant tropical vegetation and imposing mountain scenery have gained for them among the Portuguese the sobriquet 'The Pearls of the Ocean'. São Thomé (320 square miles), about half as large again

as the Isle of Man, has an extinct volcano rising some 7,000 ft. above the sea. Principe (42 square miles), much the same size as Jersey, rises to about 3,000 ft. A total population of 60,000 is divided between them in proportion, roughly, to their size. Their economic importance has dwindled with the decline of slavery. At one time coffee was paramount among the many crops grown in the prolific soil. In the nineteenth century cocoa came to the fore, and before the First World War the islands were credited with an annual production of 35,000 tons; but this too has dwindled. The exports of local produce from both islands in 1950 was valued at about £2½m. São Thomé has a few miles of light railway.

SPANISH

The Canary Islands lie to the west of the Spanish sphere in Southern Morocco, the nearest island being about 65 miles from Cape Juby, and the other islands stretching west for 250 miles or more. There are seven inhabited islands, of volcanic origin, besides islets and rocks, the whole having an area of nearly 2,900 square miles (about three times that of the Orkney and Shetland Islands) and forming two provinces of Spain. The largest island, Teneriffe, is about the size of Oxfordshire—a quarter of the whole group; next in size is Fuertaventura, and then comes Grand Canary, about one-sixth of the whole. Teneriffe and Grand Canary are easily the best known members of the group; they support some 500,000 of the total population of 750,000, and their two chief towns alone are the homes of nearly 250,000—138,000 in Las Palmas (Grand Canary), and 103,000 in Santa Cruz (Teneriffe).

The high density of the population, relative to the mainland territories of Africa, is all the more remarkable in view of the mountainous character of the islands—the lowest of them reaches over 2,000 ft., while the famous Peak of Teneriffe attains to over 12,000 ft.—and is evidence of the favourable climatic and other conditions which account for one of the chief industries of the islands, the tourist traffic. These conditions are also conducive to agricultural industry, and in the course of time there has been a succession of outstanding products—wines till disease wrought havoc in the vineyards in the middle of last century; then cochineal, till the discovery of aniline dyes reduced the profits of the industry; and more recently, before the Second World War, fresh vegetables and fruits, especially early potatoes, tomatoes, and not least bananas, of which 182,000 tons were exported in 1930. The banana exports fell away to some extent before the war—in 1934–38 they averaged 130,000 tons—and during the war they dropped to less than half that figure. The fruit is smaller and finer than the species mostly found on the market in Britain (see page 216), and normally is in keen demand among discriminating buyers.

AMERICA

America, the New World, is less than one-half of the aggregate size of the three great continents of the Old World—Europe, Asia, and Africa. Its population, exceeding 300m., is to the extent of at least two-thirds of European descent. Negroes originally introduced as slaves make up rather under 10 per cent. and native Indians, now mainly in South America, about the same. Immigrant Chinese and peoples from India account for less than 1 per cent.; the remainder are of mixed origin.

The commerce of America taken as a whole has one striking feature, namely, the vastness of the scale on which it is carried on relatively to the density of the population, though this is less true than formerly. Countries are growing up and becoming more self-contained. The prevailing characteristic of the development of American resources was for long the rapid utilisation of cheap land by devoting it on a large scale to the production of the commodities for which, under existing conditions of commerce, it is best suited. Gradually, however, one country after another, especially since the First World War, is taking on the features of the countries of the Old World—the diminution in the surplus of primary materials available for export and the extension of secondary industries or manufactures. The United States has passed this stage and so, in a large measure, has Canada.

In consequence of this there has been, and to a large extent still is, a large preponderance of bulky articles (foodstuffs and raw materials) among the exports of the two continents, and this made it in general impossible to balance the outward with the inward trade as regards quantity. Large numbers of empty railway wagons had to be hauled to the producing regions of the interior. This was an inducement to the railway companies to reduce the inward rates of carriage to the lowest point, for it is obvious that in these circumstances anything earned over the cost of collecting, handling, and delivering the goods is a profit to them. In some cases, however, the conditions were reversed until the opening of the Panama Canal in 1914. The trade across the Rocky Mountains carried on by the Canadian Pacific Railway was larger inwards than outwards. Inwards were carried large quantities of lumber, shingles, and other forest products of the Pacific seaboard, besides such less bulky

articles as sugar, tea, and other products of the Pacific islands and the Orient. Since the opening of the Panama Canal, however, Vancouver has become Canada's first or second grain port for the wheat of the Prairies.

The situation of the American continent about midway between the most populous and productive parts of Europe on the one side, and Asia and Australia on the other side, is likewise noteworthy in relation to American commerce. The advantage of this position became more apparent as population increased on the west side of the continent. Nevertheless, the western market of America remains comparatively small, and such products as eastern Asia supplied or supplies are often imported by the longer, but unbroken, sea-route through the Panama Canal. Until the cessation of trade, during and after the Second World War, tea, for example, though imported into the United States almost exclusively from China and Japan, entered that country mainly by eastern ports. In 1925 as in 1886 only about one-tenth of the whole was introduced by way of San Francisco and other ports on the Pacific. The most important eastern product the greater portion of which was introduced into the United States by western ports was raw silk. Raw silk is valuable in proportion to its bulk, and therefore best fitted to bear the cost of land-carriage.

In North America the shortest trans-continental line north of the Gulf of Mexico is in Canada. Till 1914 the only railway that had a through line there was the Canadian Pacific (see below, p. 734). The wheat of the Prairies is the chief product carried eastwards by this route, and the arrangement of the long lakes Winnipeg, Manitoba, and Winnipegosis, must force all the traffic from the Prairies to the south of those lakes. That is why most of the lines of the Canadian Prairies converge on Winnipeg, and why the town has grown with such rapidity.

There are several routes from the eastern seaboard to the interior of North America which run partly through Canada and partly through the United States. The short line of the Canadian Pacific through Maine is mentioned below (p. 735). The Sault Ste. Marie-Minneapolis branch of the same railway is re-connected with the main line a little to the west of Regina by a line which re-enters Canada at Portal, and which brings down vast quantities of Canadian wheat to be milled at Minneapolis. By another route New York is connected with Chicago by a line which passes over the Niagara river at Buffalo into Canada, and then re-enters the United States by Windsor and Detroit.

The trans-continental lines which lie entirely within the United States have to cross both the Appalachian system and the Rocky Mountains, which necessitate great windings and steep gradients. In the east railways on both flanks of the Hudson run northwards for

more than 140 miles to take advantage of the same breach in that system, the Mohawk valley, as is made use of by the Erie Canal in proceeding westwards to Buffalo and Chicago (New York Central). This deviation raises the distance between these two points to upwards of 980 miles. A shorter route by the Pennsylvania Railroad, 912 miles in length, connects the two places by way of Philadelphia (90 miles) and Pittsburgh (444 miles), but in one part this route has an average gradient of 1 in 60 for 11 miles, and some very severe curves.

The termini both of the West Shore line running up the right bank of the Hudson and of the line belonging to the Pennsylvania Railroad Company through Philadelphia to Chicago formerly had to be reached by ferry from New York, but a large terminal station was constructed by the Pennsylvania Railroad Company in the heart of the city and tunnels have been pierced under the harbour to connect the city, including Brooklyn, with the New Jersey shore. These tunnels, however, serve only for passenger traffic. A vehicular tunnel under the Hudson has also been completed, in addition to the George Washington Bridge. The New York Central Lines have been brought into the very heart of New York (Grand Central Terminal) by tunnels through which the trains are drawn by electric engines.

The connection of Chicago, and thus of the eastern seaboard with San Francisco (or rather with Oakland on the east side of the Bay of San Francisco) by the completion of the Union and Central Pacific Railroad, through Des Moines and Omaha, was effected in 1869, and this was the first trans-continental connection north of the Isthmus of Panama. The total distance by this route between New York and San Francisco *via* Philadelphia is 3,270 miles. After the first connection in 1869 other trans-continental rail links soon followed though the Western Pacific was opened as late as 1909. Though this line has easier gradients than the Central Pacific, it is considerably longer.

The Northern Pacific and the Great Northern railways, both have for their eastern terminus St. Paul, 410 miles by rail north-west of Chicago. The distance by the Northern Pacific from St. Paul to Tacoma, on Puget Sound, is 1,912 miles, to Portland 2,056 miles, those from New York by Philadelphia 3,234 and 3,378 miles respectively. By the Great Northern Railway the distance of Seattle, on Puget Sound, from St. Paul is 1,823 miles, from New York 3,145 miles.

The Atchison, Topeka, and Santa Fé Railway and the Southern Pacific both establish connections with San Francisco by way of the southern half of the Californian valley. The former completes a trans-continental connection by way of St. Louis, where the Mississippi has been bridged since 1874.

Only a comparatively small number of commodities are conveyed by these trans-continental lines from the western to the eastern seaboard. Great quantities of Californian fruit and of hops and apples from Oregon, Washington, and British Columbia are carried far eastward by rail, but the large timber of British Columbia and the States of Washington and Oregon is now carried largely through the Panama Canal. The great bulk of the commodities conveyed over these lines are the products of the Prairies east of the Rockies—living animals (mainly for the slaughter-houses of Chicago), grain to the lake ports of Chicago, Duluth, Superior, and Fort William, or for farther transport eastwards by rail, and other agricultural products, besides ores and metals from mines in the mountains. Westwards are carried chiefly coal and manufactured goods, but in Canada the export of grain through the permanently ice-free port of Vancouver has become increasingly important. Before the opening of the Panama Canal considerable quantities of Hawaiian sugar were imported at San Francisco to be again dispatched by sea at Galveston for eastern ports, but this was exceptional. It is for this kind of traffic, however, that the Tehuantepec railway (the international importance of which largely disappeared with the opening of the Panama Canal), the Panama railway, and the Panama Canal are designed. An important advantage of all these last connections between the Atlantic and Pacific is the fact that the great circle route from their Pacific termini to Japan and northern and middle China nearly follows the trend of the coast of North America as far as California, and even San Francisco is not very far out of such a direct course. On the Atlantic side again there is the advantage that from Bishop's Rock, Scilly Isles, at the entrance to the English Channel, the route is not greatly lengthened for the Atlantic termini of the Panama Canal by a call at one or other of the eastern ports of the United States. The direct route from Bishop's Rock to Colon is 4,356 nautical miles; the route by Hampton Roads little more than 250 miles farther.

Until 1948 the only trans-continental railway route in South America, unless we include that from Buenos Aires through north-western Argentina and Bolivia to Arica or Antofagasta in Chile or through Bolivia with a steamer link across Lake Titicaca to Mollendo, was that which connects Valparaiso in Chile with Buenos Aires, with a length from sea to sea of 883 miles, opened May 25, 1910, but destroyed by flood in January 1934 and later relaid. Between Los Andes on the Chilean side of the mountains and Mendoza on the Argentine side it passes beneath the Uspallata Pass in a tunnel nearly two miles long with a summit level of 10,469 feet, now converted to a road and rail tunnel. The mountain section of this railway, 153 miles in length, is on the metre gauge, the remainder on the Argentine standard gauge (5ft. 6in.).

The opening of the Panama Canal in August 1914 brought about many changes in ocean routes, and, contrary to the expectations of many, the net tonnage of the shipping making use of the Canal increased till, a few years after the First World War, it was about equal to the net tonnage passing through the Suez Canal. The two continued to invite comparison till the outbreak of the Second World War, with the Suez Canal rather more than holding its own, whereas from 1924 to 1939 there was little change in the annual tonnage passing through the Panama Canal (ranging for the most part from 25m. to 27m. tons). With the delayed entry of the United States into the War, the Panama Canal took the lead for a year or two, but then the Suez Canal went ahead again, and in the post-War years the figures of its shipping have gone up by leaps and bounds, far outstripping those of the Panama Canal, whose progress, however, if less spectacular, has been substantial and steady. (See pp. 641 and 798.)

In general, the Panama Canal would not seem to have such fundamental advantages as the Suez Canal. The latter canal greatly shortened all the voyages between the most important ports of the East and West, the West including the eastern seaboard of North America. In a minor but still important degree, it also shortened the distance from Australia to Europe. On the other hand, the Panama Canal effects no shortening of distance between Europe and the East or Europe and Australia. It does not even make the distance from New York to Shanghai (that is, the Yangtse valley) shorter than that from Liverpool or London by the Suez Canal. Its most important effect was to bring the western side of America nearer to the Atlantic, and that side of America has, of recent years, greatly increased its productivity. The early rapid increase in traffic through the Panama Canal was due mainly to the growth of the carriage of Californian oil to the Atlantic side, and second to oil came Puget Sound timber. It is noteworthy that the cargo tonnage from the Pacific to the Atlantic was, and to a less extent still is, much more than that in the reverse direction.

A great change has been effected in the North American continent by the development of all-weather motor highways. The United States has two-thirds of the total number of motor vehicles in the world and the volume of passenger and goods traffic is enormous. It is difficult to realise how recent is the development of these metalled or concrete motor-roads. Although by 1934 there were several good motor highways from coast to coast, in each case a short length of each route remained to be adequately metalled. In 1952 Canada had not yet a coast to coast highway. During the Second World War American Army engineers constructed the highway known as the Alcan or Alaskan Highway through Canada to Alaska. The great project of the Pan-American Highway from

Canada to Argentina was complete in 1952 in the United States, but not in Central and South America.

The American countries, especially the United States, have waged a constant war aiming at the conquest of distance. A most successful weapon has been the aeroplane. Regular air routes link all the larger cities and the journey from the Atlantic coast of the United States to the Pacific is covered in less than 12 hours. In South America, the regular services encircle the continent and link its capitals with New York.

NORTH AMERICA

Including the West Indian Islands, this division of the New World comprises more than half the area and nearly three-fourths of the population belonging to the whole.

The **surface** is made up mainly of plains and tablelands, and the great mountain chains have a more or less southerly trend. In the west a series of lofty mountains stretches through the entire length of the continent, rising from a tableland, 4,000 feet or more in height, which at its widest (about lat. 40°) extends over fully one-third of the breadth of the United States, and east of the mountains slopes very gently downwards to a great plain. The mountain chain which rises above this tableland in the east is the Rocky Mountains, in the stricter application of that name. There are also a great number of shorter mountain ranges, which vary the surface of the tableland, and nearly all of which trend north and south, or in a direction which does not greatly deviate from that. The Cascade Mountains and the Sierra Nevada are the principal mountain chains that border the tableland in the west, in the wider part of the continent; and still farther west are lower mountains, known as the Coast Range. Towards the south, in the narrower part of the continent in Mexico, the tableland stretches almost from sea to sea. Several railways now cross these mountains. Those in the middle part of the system, where the traffic is most active, do so at passes varying from about 5,300 to upwards of 8,000 feet in height. The only other great mountain system of North America is that of the Appalachians or Alleghany Mountains, which extend in long parallel chains roughly in the same direction as the Atlantic coast.

A chain of magnificent lakes, Lakes Superior, Michigan, Huron, Erie, and Ontario, is drained by the St. Lawrence into the Atlantic, and together with that river forms an invaluable means of internal communication. The great rivers of the plain are, or at least have been, likewise of the highest service in this respect.

The general correspondence between the **climate** of the west of North America and that of western Europe, and between the climate of the eastern side of the continent and that of eastern Asia, has been referred to in the paragraphs relating to climate generally (p. 24). Here two features in that correspondence may be recalled to mind—first, the more equable climate of the temperate zone in the west than in the east, and secondly, the dearth of rain in the west, south of the parallel of 37° or 38° N.; and it is only necessary to add some particulars regarding the effect of some of the great physical features on the climate of the continent.

Important climatic effects are due to the direction of the mountain chains. The western mountains, shutting off the moisture from the Pacific, cause a large part of the interior of the United States to be too dry for agriculture without irrigation. It is mainly from this cause that the greater part of the area of the United States west of 100° W., with the exception of a portion of the maritime strip, has this arid character (see p. 40). Further, the open plains and gently rising ground between these mountains and the Appalachians allow even the most southerly points of the United States, as well as the east coast of Mexico, to be swept from time to time by keen winds from the north, so that ice forms at the mouth of the Mississippi in lat. 30° N.; and even in the extreme south of Texas (lat. 26° N., about the same latitude as Patna in Bengal) as much as 14° of frost has been experienced. In some years severe frosts may seriously injure a large proportion of the trees in the orange-groves of Florida, and the recurrence of frosts extinguished for a time orange-growing in all the Gulf States. Even below St. Louis ($38\frac{1}{2}^{\circ}$ N.) the Mississippi navigation is partly closed by ice for 33 days a year on the average.

Other important effects on the climate are due to the great gulfs in the north and south, Hudson Bay and the Gulf of Mexico, as well as the Great Lakes, the aggregate area of which is larger than that of Great Britain. Besides exercising through the agency of winds an equalising effect on the temperature, they are all sources of moisture, especially during the summer months, when moisture is most needed. It is in a large measure from this cause that north and east of the arid region of the continent the plains are supplied with rain enough at least for the growth of pasture grasses and other herbage. These plains form the prairies of North America. They are for the most part treeless, except in the valleys along the water courses.

For a long period after the discovery of America, the only important commodities furnished by North America were the precious metals derived from the West Indies and Mexico and cod from the Grand Bank of Newfoundland. The West Indies and Mexico were entirely in Spanish hands. The feeble Indians of the islands were easily subjected at the time of their discovery in 1492

and the years immediately following, and the Aztec empire in Mexico was overthrown by Cortez in 1519-21. The mines of the precious metals in the West Indies were soon exhausted, but those of Mexico have never ceased to be extremely productive. Though the first English voyage to America, that which set sail from Bristol under the Venetian, John Cabot, in search of a north-west passage to India, was made in 1497, and though it was in virtue of that voyage that the English afterwards laid claim to a great part of the coast of North America, the first settlements in the temperate latitudes of that continent were made by the French. The banks of the St. Lawrence were explored by Jacques Cartier in 1533-43; but the most successful French settlements were due to the efforts of Samuel Champlain (1602-35). He founded Quebec in 1608, and a few years after his death Montreal was founded in 1642. French explorations and a few isolated French settlements were made higher up, but the rapids above Montreal put a limit to continuous settlement by the French. All the territory on both banks of the St. Lawrence below Montreal continued to be French till the capture of Quebec by General Wolfe in 1759. Meantime settlements were made by other countries elsewhere. The first attempted settlement of the English was a failure. It was made on Roanoke Island in Pamlico Sound at the suggestion of Sir Walter Raleigh in 1585, but the survivors of the settlement were brought back to England by Sir Francis Drake in 1586. The first successful English settlement, known as Jamestown, was made in 1607 on a promontory of the James River, at the mouth of Chesapeake Bay. This former promontory is now an island in the river, on which the relics of the settlement are carefully preserved by the government of the United States. The next English settlements were made in Massachusetts—at Plymouth in 1620, and on Massachusetts Bay in 1628-30. In 1612 the Dutch began to trade at the mouth of the Hudson, a river ascended by the English navigator of that name when in Dutch service (1609), and in 1623 the first regular colony was founded by the Dutch West India Company on Manhattan Island. This formed the nucleus of New Amsterdam, whose name was changed to New York when it was taken by the English in 1664. Forest produce, hemp, and in the southern settlements tobacco, formed the principal articles of export trade among these communities. Early in the seventeenth century, however, furs began to reach Europe from Hudson Bay, and in 1670 this trade became a monopoly of the English Hudson's Bay Company. Sugar, coffee, and cotton gradually came to be important products of the West Indies, but it was not till after the severance of the English colonies from the mother country in the American Revolution or War of Independence (1776-83) that cotton came to be extensively cultivated on the mainland. But the great commercial develop-

ment of North America was that which followed the introduction of steamships and railways. By that means bulky produce of the far interior, such as grain and provisions, could for the first time be conveyed to Europe at a sufficiently low cost to allow of the growth of an immense trade in these commodities.

GREENLAND

Greenland is a large mass of land, a lofty plateau, almost wholly buried under ice except for parts of the coasts and the 'nunataks' which rise above the ice. The few settlements on the west coast, inhabited chiefly by Eskimo under Danish rule, are of little importance in commerce. Greenland was formerly the only source of cryolite from which aluminium was extracted before the more refractory ore bauxite was used. The development of aerial transport at first directed attention to the possibility of developing a great circle route *via* Greenland, but the increasing range of modern aircraft made this unnecessary.

CANADA¹

Canada is situated to the north of the United States, from which it is separated partly by the middle line of Lakes Superior, Huron, Erie, and Ontario, partly (west of the Lake of the Woods) by the parallel of 49° N. The inhabitants are mainly of British origin and Protestant in religion; but French Roman Catholics make up more than one-third of the population, chiefly in Quebec, where the first colonists were French. There are about 130,000 Indians, most of whom are hunters, roaming over the northern and western forest regions, and living by the sale of furs to the fur-trading companies. The islands of the Arctic Archipelago are of interest in the history of commerce, from the fact that a north-west passage to eastern Asia was for centuries sought in vain among the channels that separate them. A passage was at last effected by MacLure in 1850-53, but the route is too much encumbered by ice to be of any use commercially.

Modern Canada was born in 1867, through the union of separate colonies. It has a general government and parliament for the common affairs, but it has ten provinces (some of which correspond with old colonies) with separate parliaments, empowered to deal with matters of local concern. These provinces are Nova Scotia, Prince Edward Island, New Brunswick, Quebec, Ontario, Manitoba,

¹ We are greatly indebted to Professor J. Lewis Robinson, of the University of British Columbia, for comments on this section.

Saskatchewan, Alberta, British Columbia, and Newfoundland, the last named joining in 1949. In addition to these there is a vast territory to the north-west of Hudson Bay, not yet so organised. The Yukon territory was separated in 1898 and the three Prairie Provinces as well as Ontario and Quebec have been enlarged at the expense of the North-west Territories which, since 1920, have been divided into the three provisional districts of Franklin, Keewatin, and Mackenzie. The seat of the general government is Ottawa, in the province of Ontario.

The **extent** of Canadian territory is upward of 3·8m. square miles, but the more populous portions of this vast area are confined to the region south of the St. Lawrence west of the city of Quebec, the land on the north adjacent to that river and to the Great Lakes from Quebec to the eastern shores of Lake Huron, the southern parts of the three Prairie Provinces and the south-west of British Columbia. The whole of the more populous area lies farther south than southern England.

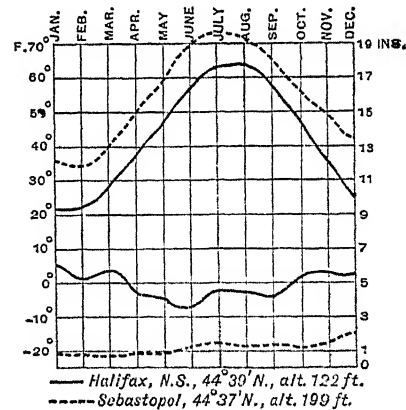
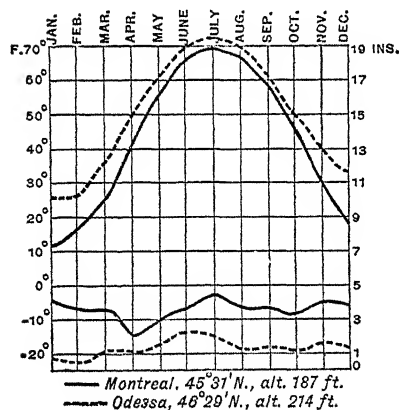
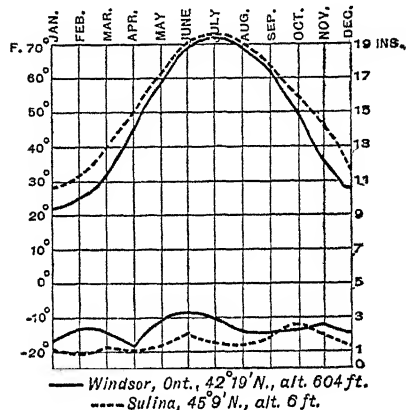
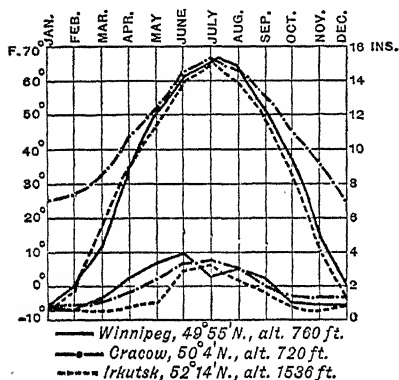
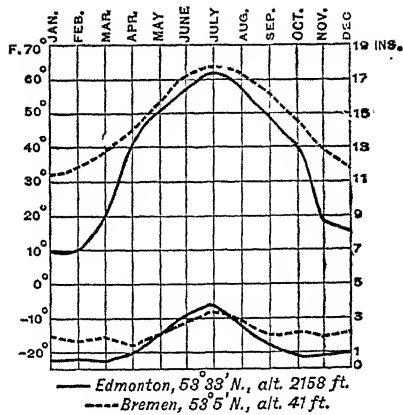
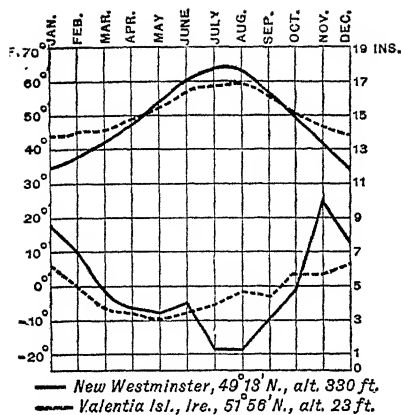
The **surface** east of the Rocky Mountains is made up principally of plains and undulating lowlands. Tundras, similar to those of northern Russia and Siberia, cover large tracts in the north, descending in the east to about 58° N. on the western shore of Hudson Bay, and still farther east extending along the whole coast of Labrador. Southwards follows a range of vast forests, chiefly of spruce, a region that embraces the whole of the country east of Lake Winnipeg, except the tundra area and the limited agricultural area in the south. Farther to the west, this forested region is succeeded to the south by the prairies, which extend farthest north on the gently sloping tablelands immediately to the east of the Rocky Mountains. The nearly treeless prairies here extend about 3½ degrees north of the United States frontier, and the area with less than 20 per cent. of forest land reaches about 10 degrees north of that frontier, between the Rocky Mountains and Lake Athabasca. In the development of Canada in the present century this prairie region has been of the highest importance, for it contains vast areas now under the plough, with soil of the richest description, and a climate admirably adapted for agriculture, though very different from that of England. In this prairie region there is a rise on the whole from east to west, and this rise takes place in such a manner as to form what are known as the three prairie levels or steps. The lowest level in this region is that of the Red River valley, between 700 and 800 feet. West of that plain the surface rises to about 1,500 feet, and this terrace stretches westwards for about 250 miles. The ground then rises to about 3,000 feet, and then the rise is more gradual to the foothills of the Rocky Mountains.

In the eastern half of the Dominion, the **geological structure** is of peculiar geographical importance. It is of such a nature as

must for ever forbid extensive agricultural settlement. From the banks of the St. Lawrence, some little distance below Quebec, to the Red River valley and north-westwards to the Mackenzie River, there extends an enormous region of ancient crystalline rocks—the Canadian Shield—protruding in many places in naked masses, in other places having only a thin covering of soil supporting forests of spruce and pine. The principal exception to this character is the area already referred to as the most populous of Canada, but there are also many larger or smaller isolated valleys with a deep and fertile soil.

The general similarity between the climate of North America and that of corresponding latitudes in Europe and Asia is noticed on p. 46, but some details are of importance (see the accompanying diagrams). East of the Rocky Mountains the climate of Canada generally is characterised by those extremes of temperature which prevail in the same latitudes in the northern hemisphere everywhere, except in regions exposed to south-westerly winds from the ocean. But an important difference between western Canada and Europe is due to the fact that the whole area between the Rocky Mountains and the Pacific coast is mountainous, and that the mountains run throughout parallel to the coast and nearly at right angles to the prevailing winds. Hence great contrasts, in respect of both rainfall and temperature, begin within a short distance of the Pacific. At New Westminster, at the mouth of the Fraser, the mean temperature of the coldest month of the year is 36° F., of the hottest about 63° F., and the total precipitation¹ is 65 inches; at Lillooet, higher up the Fraser valley but behind the Coast Mountains, the corresponding figures for temperature are 22° F. and 68° F., for rain- and snow-fall about 13 inches. To the east of the Rocky Mountains the total precipitation is scanty, though it begins to increase again in eastern Saskatchewan. But as affecting the cultivation of grains, two considerations must be borne in mind. First, it is important that the great bulk of the total precipitation takes place during the summer, especially the early summer, months. (See p. 42.) Second, throughout Canada a considerable proportion of the precipitation takes place in the form of **snow**, the amount of which, however, is much greater in the east than in the west. At Montreal the average of the thirty years previous to 1914 was over 120 inches; at Toronto, the average of the same period, 58 inches; and even in 42° N., in the extreme south of Ontario, the same latitude as the northern frontier of Portugal, in a district in which grapes are grown for wine-making in summer, the average of fourteen years was 57 inches. At Winnipeg, in Manitoba, the average of thirty

¹ Including both rain and snow. The meteorological office of Canada reckons ten inches of snow as equal to one inch of rain (of course only a very rough average).



COMPARISON OF METEOROLOGICAL DATA, CANADA, EUROPE AND SIBERIA.

Mean temperature curves above, rainfall below.

Degrees F. numbered on left, inches of rainfall on right.

Canadian curves continuous, European or Asiatic dotted or broken lines.

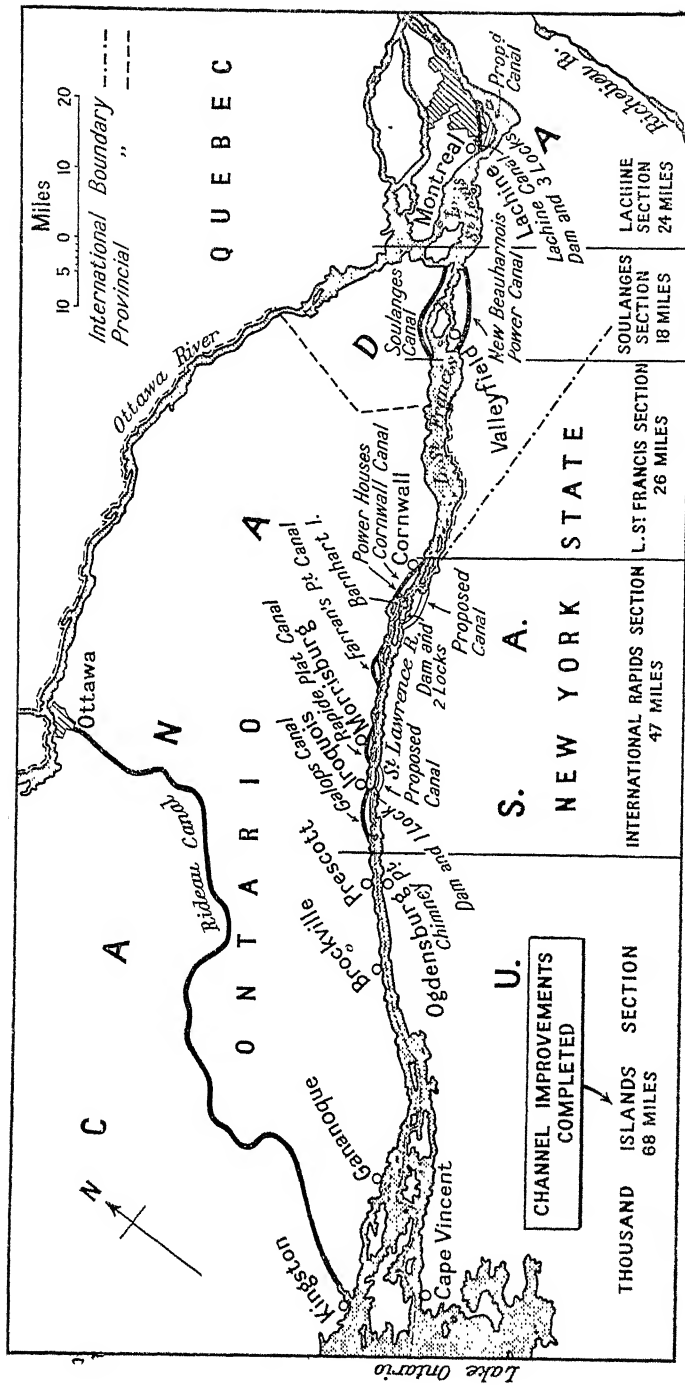
years (1885-1914) was only 49 inches. Two advantages for wheat-growing accrue from this snowfall, one experienced principally in the eastern half of Canada, the other in the west. In the east the total precipitation is ample, and is fairly equally distributed throughout the year, and there the great advantage of the snow as regards wheat-culture is that it protects the ground against the severe frosts. There accordingly winter wheat (or, as it is called in America, fall wheat) can be regularly grown, whereas in all the Prairie Provinces the frost comes before the snow, and hence only spring wheat can be cultivated. But in this part of Canada it is important that the melting in spring of water frozen underground furnishes moisture just when it is wanted. In the more arid parts of the prairies, however, **irrigation** is necessary—in the southern parts of Saskatchewan and Alberta. The Canadian Pacific Railway Company has constructed and operated in the Province of Alberta three large projects known as the Eastern, Western, and Lethbridge sections. The water is obtained from the Bow River and the St. Mary River. There are other important schemes in Alberta as well as many hundred small schemes in Saskatchewan and Alberta.

In those parts in which wheat is most largely grown, it is not the total amount of the annual rainfall that determines the amount of the produce. The annual precipitation in Manitoba for example has varied from 12 to 22½ inches and the average yield of wheat per acre between 9 and 28 bushels, but there is no marked correspondence between the rainfall and the yield, though the rains of May and June seem to be particularly significant. (See the rainfall diagram for Winnipeg, p. 731.) The chief disadvantage of the Canadian climate for wheat-growing, and especially in the north-west, is the liability to the occurrence of **frost** before harvest, but this risk is being greatly reduced by the careful selection of seed and the cultivation of hardy varieties of wheat, which ripen quickly, and, as it happens, yield hard wheats of exceptionally high value. The use of these quick-maturing wheats has made possible the settlement of the Peace river area as a sort of extension of the prairies. The correspondence between some temperatures of Canada and those of Eurasia is indicated on p. 731, but it must be remembered that the summers that follow the cold but dry, invigorating, healthy, and pleasant winters are remarkably bright as well as warm. The whole of Canada, with the exception of near the coast in British Columbia, is favoured with more sunshine than any portion of Great Britain, Germany, Holland, or northern France. In winter the temperature in districts adjacent to the great mountain ranges is greatly mitigated by warm, dry, or moist winds, from the south-east, south or south-west, west of the Rocky Mountains, and from the south-west, west or north-west to the east of the Rocky Mountains, those in the latter case being such as are experienced in all parts of

the world on the lee-side of mountains exposed on the weather-side to copious rains. In Canada they are known as chinook winds. In southern Alberta they cause the cold of winter to alternate with spells of bright warm weather, in which the ground is swept bare of snow and the pasture grasses are revived, and they thus help to make the rearing of livestock the characteristic industry of this part of the prairies.

With regard to the **internal communications** of Canada, it is noteworthy, in the first place, that the St. Lawrence River and the Great Lakes, supplemented by a number of short canals (the longest is about 27 miles), form a system of internal navigation for sea-going vessels unparalleled in any other continent. The first of the canals to be constructed was the Lachine Canal immediately above Montreal, opened in 1824, and other canals between Montreal and Lake Ontario were completed by 1843. The Welland Canal, which runs parallel to the Niagara River and avoids the Falls of Niagara between Lakes Erie and Ontario, and is the longest, was constructed in 1824-29. It has been reconstructed several times, finally as the Welland Ship Canal opened in 1931. The difference of 325 feet in the level of the two lakes was overcome by seven locks 800 feet by 80 feet. Vessels drawing up to $23\frac{1}{2}$ feet can pass through and in 1951 Canada finally decided to reconstruct the St. Lawrence canals (see map overleaf) to enable such large vessels to pass from the Great Lakes to tidal waters at Montreal. The shortest, but perhaps the most important of the Canadian canals is the Sault Ste. Marie ('Soo') Canal between Lakes Superior and Huron, which was constructed between 1889 and 1895. It is little more than a mile in length, and has only one lock. Since 1855 there had been a canal on the United States side at the same place. The traffic through these canals, since reconstructed, is in the forefront of the world's canal traffic—much greater than that through the Panama Canal. In 1855 the registered tonnage that passed through the United States Canal was little more than 100,000 tons; in 1875, above 1m. tons; in 1890, above 9m. tons. The actual freight carried in 1913 was 42·7m. tons, of which close upon 5m. passed through the Canadian lock. In 1934 over 18m. tons of freight passed through Canadian canals alone, and the total is still increasing, reaching 25·5m. tons in 1950.

By this series of **waterways**, small sea-going ships may be carried up a distance of 2,250 miles from the straits of Belle Isle, in the north of Newfoundland, to Fort William on Lake Superior, and within about 1,900 miles by rail from Vancouver, the seaport at the Pacific terminus of the C.P.R. On the United States side they are carried up a distance of 2,400 miles to Duluth, at the very head of Lake Superior, which is now within 1,890 miles by rail of the nearest Pacific port.



Showing the existing state of navigable channels in 1953 and the proposals for improvements to convert the whole into a 'seaway' usable by ocean liners.

The St. Lawrence navigation is usually open from about the end of April to near the end of November, or even the first week in December. The route from the mouth of the St. Lawrence, round the north of Newfoundland (by the straits of Belle Isle), is closed for a longer period than that by Cabot Strait, round the south of Newfoundland, which adds about 160 miles to the distance to Liverpool. With a view to extending the Great Lakes navigation, so as to develop a bigger export of grain through Dominion channels, ice-breakers are available where they are required—Port Arthur, Fort William, the Sault Ste. Marie Canal, and elsewhere. All the lights on Lake Superior, Lake Huron, Georgian Bay, Lake Erie, and Lake Ontario are kept in operation until the end of December, or later, if possible.

Besides the leading highway for ships, the Canadian Dominion possesses other less important inland waterways. The River Ottawa is continuously navigable, with the aid of a few canals, as far as the city of Ottawa; and from thence there is a navigable though little used connection by the Rideau River and Canal with Kingston on Lake Ontario.

Above Lake Superior, navigation can be continued with canoes and motor-boats by Rainy Lake and River, Winnipeg Lake and River, and the North Saskatchewan River to near the base of the Rocky Mountains. The Assiniboine and Red River, which both belong, like the Saskatchewan, to the basin of Lake Winnipeg, are likewise navigable by very shallow draught boats, but the Nelson, the outlet of Lake Winnipeg to Hudson Bay, is too much obstructed by rapids to be of any service as a waterway. In the summer there are regular services on the Mackenzie and Yukon rivers.

In the more populous parts of Canada there is a tolerably complete network of railways, and since November 1885, when the Canadian Pacific Railway was completed, there has been uninterrupted railway communication from ocean to ocean within Canadian territory. The tables overleaf exhibit some of the more important elements in the comparison of this railway, as a trans-continental means of communication, with the chief trans-continental routes of the United States. It will be observed that the Canadian Pacific has an advantage over both its older rivals, the Northern Pacific and the Union and Central Pacific, in the lower height of its passes, and the shorter length of route at high levels. The Great Northern Railway, the main line of which was completed in 1893, has, however, as favourable a route on the whole as that of the Canadian Pacific. The Canadian Northern Railway, which was begun in 1896, is now part of the Canadian National system. It extends from ocean to ocean, and operates trains between Quebec and Montreal in the east and Winnipeg, Edmonton, and Vancouver in the west. Between Edmonton and Vancouver it uses the Yellow-

head Pass and the through line was completed in 1915. Another line runs to the Pacific port of Prince Rupert. The company got into financial difficulties, and, like the Grand Trunk Railway, passed under government ownership and operation.

TABLE I

Railways across Rocky Mountains and Pacific Coast Ranges.

Railway.	Height in feet of Summits.	Maximum Gradient expressed as percentage of Rise for a Given Length.		Date of Completion.
		Westbound.	Eastbound.	
Canadian Pacific	5,344	1·2	2·2	1885
Canadian National (Grand Trunk Pacific)	3,712	0·5	0·4	1914
Canadian National (Canadian Northern)	3,700	0·5	0·4	1915
Great Northern	5,202	2·2	2·2	1897
Northern Pacific	5,569	2·2	2·2	1883
Chicago, Milwaukee, and Puget Sound	6,350	0·3	0·3	1909
Union and Central Pacific . .	8,247	2·0	2·2	1869
Union Pacific and Oregon . .	8,247	2·2	2·0	1884
Santa Fé	7,510	3·5	3·3	1883
Denver and Rio Grande . .	10,239	1·4	2·3	1871
Western Pacific	5,712	1·0	1·0	1909
Southern Pacific	4,610	2·0	2·0	1883
San Pedro, Los Angeles, and Salt Lake	6,060	1·6	3·0	1905

TABLE II

Railway.	From	Length in Statute Miles.	Length in Nautical Miles from respective Pacific or Atlantic Ports to			Total Ocean Route Liverpool to Hong Kong.
			Yokohama.	Hong Kong.	Liverpool.	
C.P.R.	Vancouver	To Port Arthur . 1,915				
	Vancouver by all Canadian route . .	" Montreal . 2,908	4,330	5,890	2,800	8,690
	Vancouver, by Short Line (through Maine, U.S.) (Opened 1889.) . .	" Halifax . 3,742	"	"	2,480	8,370
	Vancouver, by shortest connections	" " . 3,595	"	"	"	"
N.P.R.	Seattle, by shortest connections	" New York . 3,162	"	"	3,030	8,920
	Portland, Oregon, by shortest connections . .	" Duluth . 1,915				
	Portland, Oregon, by shortest connections . .	" New York . 3,251	4,330	5,890	3,030	"
U.&C.P.	San Francisco, by shortest connections . .	" Duluth . 1,890				
	San Francisco, by shortest connections . .	" New York . 3,235	4,250	5,810	3,030	8,840
	San Francisco, by shortest connections . .	" Chicago . 2,356				
		" New York . 3,270	4,510	6,070	3,030	9,100

On the eastern side of the Rocky Mountains the ascent of the main line of the Canadian Pacific Railway to the summit was always comparatively easy. A gradient exceeding 1 in 100 occurred over only about half a mile. But soon after passing the summit on the west side a very rapid descent took place. There was a drop of 1,150 feet in seven and a half miles, involving gradients rising at one place to 1 in 22, so that the speed in descending had to be reduced to an average of less than ten miles an hour—at one place only five miles an hour. This dangerous piece of railway was successfully operated for twenty-four years without an accident to a passenger train, but the increasing traffic, involving heavier trains, at last rendered the reduction of the gradient a necessity. This was effected in 1909 by making the line double on itself and by piercing two spiral tunnels through mountains on opposite sides of the Kicking Horse River. Further west, where in crossing the Selkirks the line had to be protected against repeated avalanches by snowsheds costly to maintain, a tunnel through that range five miles long was opened in December 1916. Farther south another line of the same railway crosses the Rocky Mountains in the Crow's Nest Pass at an altitude of 4,453 feet.

All the railways of Canada, like most of those of North America generally, are on the same gauge as our own—4 feet 8½ inches. The majority of the railways were in the hands of private companies, but the government now owns a large mileage of important railway lines. By amalgamations most of the private railways were brought under the control of two great companies, the Grand Trunk Railway, the older of the two, and the Canadian Pacific. In 1903 the Dominion government entered into a contract with the Grand Trunk Railway Company for the construction of a new trans-continental railway from Prince Rupert, on the Pacific Coast, to Moncton, in New Brunswick. The eastern section of this line from Moncton to Winnipeg was constructed by the government, and crosses the St. Lawrence near Quebec by a cantilever bridge, the main span of which was at the time the longest in the world, being nearly 1,800 feet from the centre to centre of piers, or 100 feet longer than that of the Forth Bridge in Scotland. In 1906 Canada had 1,713 miles of government, against 20,454 miles of private railways, inclusive of electric street railways. In 1934 the mileage was 42,270, of which the government owns well over half. The Canadian Pacific (16,603 miles in 1949) is the only important privately owned railway. The government is now responsible for the systems formerly owned by the Canadian Northern, Grand Trunk, and Grand Trunk Pacific Railways. The whole group is now known as the Canadian National Railways, with a total mileage of 22,212 in 1949. There are some 4,164 miles of other lines.

The construction of a railway direct from the grain-growing

areas of Manitoba to Churchill, on Hudson Bay at the mouth of the Churchill river, was begun in 1911. Until 1927 it was intended to make Port Nelson the terminus on Hudson Bay, but the silting of the inlet there rendered the port site unsuitable. By 1929 the track was laid to Churchill, and in the autumn of 1931 the first shipment of grain to the United Kingdom by this route was made. The importance of this railway arises from the fact that it forms the shortest route for the products of the Canadian Prairies to England, but its value depends in a great measure on the navigability of Hudson Bay and Hudson Strait. The difficulties of navigation are almost confined to the strait, which is 500 miles in length, and for the greater part of the year is obstructed by ice. The strait is open, however, for at least two or three months every year, and in some years, at least for steamers of suitable build, considerably longer. The ocean length of this route from Liverpool is 2,936 nautical miles to Churchill. A hindrance to the extensive use of the route is the high cost of insurance on the vessels against the risks of ice. For these reasons the route has not proved the success which was hoped, whereas the shipment of grain *via* the ever-open Pacific port of Vancouver and through the Panama Canal to Europe has greatly increased.

The **minerals** of most importance commercially at present are gold, copper, coal (in the two forms of lignite and bituminous coal), oil, nickel, zinc, lead, asbestos, and silver, together with platinum, uranium, titanium, manganese, arsenic, cobalt, selenium, tellurium, bismuth, radium, and many non-metallic minerals. The coal-fields are enormous in extent, though as yet worked only where there are special facilities for commerce, as in the neighbourhood of seaports (in the north of Nova Scotia, and in Vancouver Island, British Columbia), and at various points on or near the routes of the Canadian railways. Extensive as the coal-fields are, however, it is important to note that, apart from the northern Ontario lignite deposits, there is no coal between the small deposits of New Brunswick and those of southern Saskatchewan, that is, in all the most populous area of the Dominion. It is this that makes Canada so largely dependent on the United States, not only for anthracite, which is often used in central heating, but also for bituminous coal. The province of Alberta is underlaid to the extent of about 17,000 square miles with bituminous and semi-bituminous coal of varying quality and anthracite is known in western Alberta. Four-fifths of Canada's total proved reserves are in Alberta (coal and anthracite). In British Columbia a coal-field producing coal of excellent quality, immediately to the west of the Crow's Nest Pass, began to be worked as soon as the branch of the Canadian Pacific Railway through the pass was opened. The amount of coal in this neighbourhood is considerable. The total Canadian production is 15 to 18m. tons

annually and twice that quantity is imported from the United States and elsewhere. The economic position of Canada has been greatly changed by the discovery of very rich oil-fields in the Prairie Provinces—especially near Edmonton in Alberta, where the fields of Leduc and Redwater proved so productive as to warrant construction of pipelines direct to the Great Lakes and Vancouver. Iron ore is met with in many places, but for long it seemed that Canada had no resources to rival those of the United States near Lake Superior occurring in rocks which are an extension of the Canadian Shield. Despite various small deposits, no iron ore was mined in Canada from 1921 to 1936, and the iron and steel industry depended upon imported ore. Then came the opening up of the Steep Rock and other deposits near Lake Superior and the discovery of vast ore bodies in the Ungava region of northern Quebec and Labrador. A railway from the shores of the lower St. Lawrence was begun after the Second World War to reach these deposits which occur in an area where climatic conditions are very severe. Gold is obtained in largest quantity from the old rocks of the Canadian Shield at Porcupine and Kirkland Lake and numerous newer localities in Ontario and Quebec, and also in Manitoba, Saskatchewan, Nova Scotia, and in British Columbia and the Yukon. The production from the once famous alluvial deposits of the latter has dwindled to a very small figure. Since 1938, however, there has been an important mine at Yellowknife in the North-west Territories. Of great strategic importance is the discovery and development of uranium ores in the region of Great Bear Lake. The silver production of Canada comes chiefly from the rich silver-cobalt ores of northern Ontario and from mixed ores in British Columbia. The latter province has a large output of copper and lead and zinc. Ontario provides the bulk of the world's supply of nickel and cobalt, and also much copper, platinum, selenium, and tellurium. Quebec is one of the world's largest producers of asbestos and has a large output of other minerals. A recent development is in non-metallic minerals, notably for cement. Aluminium is electrically reduced from imported bauxite.

The tables given below show the principal features of the **external commerce** of Canada. Wheat and wheat-flour from the Prairies remain the great staple export. The cheese export shows the importance of the dairying industry, especially in the eastern provinces but more recently in Manitoba, from which there is also a considerable export of butter, an export which has been greatly promoted by government encouragement. The enormous value of the export of wood-pulp (especially to the United States) should be noted—but especially the growth in the export of paper rather than of pulp—a testimony to the increase in manufacturing industry general throughout Canada. Among the imports iron and steel

goods, including machinery and vehicles, now hold the first place, exceeding in value the textile group including the cotton and woollen manufactures. British shipping still takes the lead in the sea-borne traffic of Canada, but no small portion is conveyed by the Canadian Pacific Steamship services (British registration) on both Atlantic and Pacific and the Canadian National Steamships to the West Indies and British Guiana.

The more important **manufacturing industries** at first were naturally those which consist in subjecting the raw materials of the country to the simplest processes, preparatory to sending the products to a home or foreign market—flour-milling, saw-milling, the manufacture of wood-pulp, paper, and various articles made of wood, the making of boots and shoes, and other industries connected with leather—but in recent years there has also been a considerable development of rubber, cotton, and woollen manufactures and other industries depending on imported raw materials and in the manufacture of agricultural implements, automobiles, machinery, and a wide variety of factory products. An attempt was made to stimulate the iron industry of Canada by bounties as far back as 1883, but the most important act with this view was that of 1897, under which bounties were granted on every stage of the iron industry from the raising of the ore to the manufacture of the steel. Under this encouragement iron and steel works were established at Sydney, N.S., Hamilton, Sault Ste. Marie, Port Arthur, and elsewhere. The bounties ceased at the end of 1910 except for wire-rod (fencing wire entering Canada duty free) and pig-iron made by electrical processes. The development of hydro-electric power has had an enormous influence on the industrial progress. Manufacturing is now by far the leading occupation in Canada.

A new feature was introduced into the external commerce of Canada by the adoption under an act of 1897 of a preferential tariff in favour of British goods, which from August 1, 1898, were to be admitted on the payment of customs duties 25 per cent. less than those levied on foreign goods. There have been many subsequent changes but the general principle remains. For example, under the Ottawa Agreement of 1932 the principle of Empire preference was further developed and this agreement was greatly extended by that of 1937. After the Second World War the position was complicated by the division of the free world (outside the U.S.S.R. and its satellites) into the 'sterling bloc' and the 'dollar bloc.' This strengthened natural ties between Canada and the United States, but cut the free movement of goods and capital between Canada and Britain.

Three-quarters of all the foreign trade of Canada are with the United States and the United Kingdom. In inter-war years the exports went almost equally to the two countries, but the United

States sent three times as many imports as the United Kingdom. The percentage value of the imports into Canada from the United Kingdom reached its maximum, 58·57 per cent., in 1871-72. After that year there was a decline till 1898-99, when the percentage was 24·05. Meanwhile the percentage of the United States had risen from 33·09 in 1871-72 to 60·96 per cent. in 1900-01. In that year, however, more than 50 per cent. of the value of the imports from the United States was duty free, as against only 26·3 per cent. from the United Kingdom. In 1913-14 the percentage value of the imports from the United Kingdom was 21·35 as against 64·0 from the United States. Inevitably the First World War told adversely on British imports, which in 1917-18 sank to 8·5 per cent. of the total, in the following year to less than 8 per cent. As throwing light on the steady gain of the United States on the United Kingdom in the Canadian market before that war it should be borne in mind that in the competition the United States has the following advantages among others: (1) that transport from the United States can be effected without break of bulk; (2) that the ports at which British goods must be transferred from ocean ships to railways or some other means of carriage are at a great distance from the most populous parts of the country (Montreal 335 miles from Toronto, 1,424 miles from Winnipeg); (3) that the large and highly protected market of the United States greatly favours the economies of large-scale production; and (4) the similarity of tastes and needs of the two countries is favourable to mutual commercial intercourse. In 1929-30 15 per cent. of the imports came from the United Kingdom, 68 per cent. from the United States. Of the exports 35 per cent. went to the United Kingdom, 46 per cent. to the United States. The trend was strengthened inevitably during the Second World War. In 1950 only 13 per cent. of imports came from the United Kingdom against 68 from the United States. Of the exports, 15 per cent. went to the United Kingdom—unable to find dollars to buy more—and 65 per cent. to the United States.

Even before the Second World War Canada had become the fourth country in world export trade, fifth in total trade, and fifth in value of manufactures produced.

Provinces and towns.—(1) **Nova Scotia** is a province including both the peninsula of that name and the island of Cape Breton to the north; in all it is about two-thirds of the size of Scotland. The fertile land, not a quarter of the whole, is mainly situated towards the west. The valleys of Annapolis and Cornwallis on the west side parallel to the coast are the most favoured districts in respect of soil and climate, and above all noted for their apple orchards. The fisheries of this province furnish a large proportion of the Canadian output of cod and lobsters. The capital, Halifax, on the east coast, is situated at the head of a fine natural harbour, which

in most years is free from ice all the winter through. It is the principal naval station of Canada. The city and harbour are defended by fortifications. There are iron and steel works at Sydney in Cape Breton Island, where coal of excellent quality for smelting purposes and limestone for flux are both found in abun-

CANADA

IMPORTS (INCLUDING BULLION AND SPECIE)

	Percentages of Total Value.				
	1924.	1926-30.	1931-35.	1938.	1951. ³
<i>Raw materials</i> . . .					
Coal and coke . . .	7.9	5.5 ¹	6.6	5.3	4.7
Petroleum and gasoline . . .	4.8	5.1	7.9	7.5	8.7
Silk and silk products . . .	2.5	2.6	1.8	0.9	0.2
Cotton and cotton products (raw cotton) . . .	7.4 (3.1)	4.3 (2.3)	5.9 (2.5)	4.0 (1.8)	4.5 (2.4)
Wool and woollen products . . .	6.0	4.3	4.0	3.4	4.0
Other textiles . . .	1.7	1.8	4.7	3.0	3.2
Chemicals . . .	3.1	3.1	5.7	4.8	4.7
<i>Foodstuffs</i> . . .					
Fruits, nuts, vegetables . . .	—	3.8	4.4	4.1	3.6
Alcohol . . .	2.4	3.5	3.3	1.0	0.5
Sugar . . .	5.3	3.0	3.7	2.8	2.1
<i>Manufactures</i> . . .					
Iron and steel (raw and manufactured) . . .	12.9	10.1 ²	7.9	4.4	5.6
Machinery (excluding electrical) . . .	—	7.1 ²	3.6	7.8	12.8
Electrical appliances . . .	—	2.8 ²	1.7	1.8	2.9
Cars . . .	3.2	5.0	3.6	5.4	6.9
Textiles (included above) . . .					
Total value in million \$. . .	796.9	1,116.2	499.2	736.8	4,085.0
<i>Countries</i> . . .					
United States . . .	64.0	66.8	57.4	57.7	68.8
United Kingdom . . .	19.0	17.2	21.4	16.2	10.3
France . . .	2.3	2.2	1.7	0.8	0.6
Germany . . .	0.9	1.5	2.1	1.3	0.8

¹ Figures for coal only, 1926-28 and 1931-35.

² Figures for 1928-30 only.

³ Excluding bullion and specie.

Par rate of exchange 1924-35 £1 = \$4.867; in 1950 £1 = \$2.80.

dance close beside the admirable natural harbour formed by the Bras d'Or Channel. The ore is obtained from Newfoundland. Nova Scotia furnishes nearly half of Canada's output of coal, and there are paper mills and other factories.

(2) **Prince Edward Island**, about the size of the county of Norfolk, is situated in the bay of the Gulf of St. Lawrence between

New Brunswick and Nova Scotia. From the nearest point of New Brunswick it is distant nine miles. The capital, Charlottetown, is on a large, deep, and well-sheltered harbour. Fox-farming is a less important industry than formerly. The rich red soil is well suited to potatoes, fruits, oats, hay, and dairy farming, hence the name 'the Garden of the Gulf.'

CANADA

EXPORTS (INCLUDING BULLION AND SPECIE)

	Percentages of Total Value.				
	1924.	1926-30.	1931-35.	1938.	1951. ²
<i>Raw materials</i>					
Wood	10.2	8.1	6.4	7.1	10.6
Wood pulp	3.9	3.8	4.1	2.9	9.3
Furs	1.6	1.7	2.2	1.5	0.8
Chemicals	—	1.5	2.2	2.1	3.4
Copper ore and products	1.2	1.0	3.5	5.6	2.2
Nickel ore and products	1.0	1.5	3.5	5.6	3.5
<i>Foodstuffs</i>					
Wheat	23.5	27.4	21.4	9.5	11.3
Milled wheat	6.6	4.9	3.2	1.9	3.0
Whisky	—	1.7	2.2	1.1	1.4
Fishery products	3.1	2.8 ¹	3.7	2.8	3.0
Meats	2.1	2.0	2.2	3.8	1.9
<i>Manufactures</i>					
Newsprint	8.6	10.2	14.5	11.1	13.7
Cars	2.4	2.7	2.1	2.7	2.1
Rubber manufactures	—	2.2	1.8	1.6	0.7
Total value in million \$	1,069	1,256	599	943.4	3,914.5
<i>Countries</i>					
United States	39.1	39.0	35.3	36.7	58.7
United Kingdom	37.0	32.9	37.8	36.0	16.1
Germany	2.3	2.8	1.3	1.9	0.9
Japan	2.1	2.7	2.4	2.2	1.9
France	1.0	1.2	2.2	1.0	1.2

¹ Excludes oils, but includes fish.

² Excluding bullion and specie.

(3) **New Brunswick**, rather less than Scotland in size, is very rich in forests, and also possesses valuable fisheries. The capital is Fredericton, but the largest town and chief seaport is Saint John, occupying a fine harbour on the Bay of Fundy, at the mouth of the river of the same name. The harbour is open all the year round, is safe, easy of access, and capable of accommodating vessels of thirty feet draught, and since the port has been connected with Montreal by the 'Short Line,' a great trade in livestock, dairy produce, and bulk-handled grain has been developed. The province is fairly rich in minerals, but there has been but little development.

Of the minerals known to occur only coal, gypsum, natural gas, and petroleum are actively mined. Coal production is associated largely with electrical power development. Gypsum is produced from Hillsboro' quarries.

(4) **Quebec**, on both sides of the St. Lawrence, mostly east of the Ottawa, is a province approximately six times the size of Great Britain, but with the limited inhabited area above indicated. In the settled south the winter is long, snow generally covering the ground (sometimes to a depth of more than three feet) from December to April; but the summer is warm enough to grow not merely the ordinary crops of the British Isles but also maize and tobacco. About four-fifths of the inhabitants of the province are of French origin and still speak French. Of late years they have spread into the so-called Eastern Townships, on the south bank of the St. Lawrence, where the bulk of the settlers were originally English. Numbers have also emigrated to the New England states, where they work in textile factories or carry on farming.

The capital of the province is Quebec, situated at the confluence of the Charles river with the St. Lawrence, and now the lowest point at which the river is bridged. Once the head of navigation for large vessels, it has had its growth checked by the deepening of the river above the city, and by other causes; for though trans-Atlantic passengers sometimes prefer to land or start here, goods show their usual tendency in favour of water carriage without transshipment as far into the heart of a country as possible. This circumstance has accordingly favoured the rise of Montreal, now the chief seat of commerce in Canada. The relative growth is shown in the accompanying table:

	1861.	1881.	1901.	1911.	1921.	1931.	1951.
Quebec .	60,000	62,500	69,000	78,000	95,000	131,000	164,000
Montreal .	90,000	141,000	279,000	470,000	619,000	819,000	1,002,700

Montreal stands on an island in the St. Lawrence, at the confluence of the Ottawa, 180 miles (by river) above Quebec. All the improvements in the communications below the port tend to increase its shipping and population. In 1906 the ship-channel up to this point had a depth of 27½ feet, but this was increased to 30 feet in 1912 and further deepening followed. The trade of Montreal was greatly stimulated by the freeing of the Canadian canals from tolls in 1903. In that year nearly 20 per cent. of the shipments of grain from Chicago and Duluth passed through Canadian territory. It is now after Vancouver, its western rival, the greatest grain port in Canada. The water-power resources of the province are enormous and have been developed especially on the St. Maurice, Saguenay, Lievre, Ottawa, and St. Lawrence Rivers. Many important storage

dams have been built. The La Loutre on the St. Maurice was at the time of its construction one of the largest artificial reservoirs in the world, with a capacity of 160,000m. cubic feet, and a water area of 300 square miles. The storage permits a permanent flow of 12,000 cubic feet per second at Shawinigan over the famous falls; in round figures, 2m. permanent h.p. are now available on this river. The Gouin dam on the river is one of the country's largest. As a result of this hydro-electric power development power lines link all important centres on the St. Lawrence lowlands, and Quebec has become the second manufacturing province (after Ontario). A great copper smelting town has grown up at Noranda. Three Rivers, at the mouth of the St. Maurice, has become a considerable town and port. The St. François dam on the river of the same name materially assisted the numerous pulp and other mills along its course; Shipshaw is even more important.

(5) **Ontario**, about four and a half times the size of Great Britain, is the province to the west of Quebec, extending along the north of the Great Lakes. The populous region, which is the most southerly part of the whole of the country, has a much shorter winter than that of Quebec. In the south, wine is produced from native grapes, and a strip running eastwards from Hamilton and bordering Lake Erie is known as 'the garden of Canada,' from its being so peculiarly adapted to the cultivation of table grapes, peaches, and other soft fruits. Despite the rapid development of the other areas Ontario still produces more than half of all fruit grown in Canada, and the province about one-half of the milk, cheese, butter, and casein of Canada. Forests cover huge areas of the north. Ottawa, the seat of the Dominion government, stands on the river of the same name, about ninety miles above its confluence with the St. Lawrence. It is a centre of the lumber, pulp, and paper industries of the province, and has some of the largest paper-mills in Canada. The capital of the province is Toronto, near the western end of Lake Ontario, on which it has a fine harbour, and is so situated as to form the centre at which the railways running from the east, parallel to Lake Ontario, begin to diverge in different directions through what has been called the Lake peninsula. The town has become a great seat of manufactures and has grown almost as rapidly as Montreal from under 100,000 in 1881 to 671,000 in 1951. Steel-works and other manufacturing industries are carried on at Hamilton at the western end of Lake Ontario, and at Sault Ste. Marie are large paper-mills and steel-works utilising by means of electricity the power of the rapids. Hydro-electric power has been developed especially on the Nipigon and Ottawa river and above all at Niagara. Hydro-electric stations on or near the Niagara River utilise the difference of level between Lakes Erie and Ontario (about 330 feet) for power development and the great works at Queenstown have turbines

subjected to a head of 305 feet—130 more than the maximum near the falls. Sudbury, Timmins, and Kirkland Lake are large centres of mining and metallurgy. Fort William and Port Arthur on Lake Superior are great centres for the shipment of western grain. Midland, Collingwood, Goderich, and Port Colborne are now also important wheat-reception ports where the wheat of the west is received and then railed, in the form of wheat or flour, largely to Montreal. Cobalt, near Lake Temiscaming, in northern Ontario, was formerly famous for cobalt and silver. Windsor, like Detroit in the United States, is devoted to the manufacture of motor-cars, and other manufacturing centres include Ottawa and London.

(6) **Manitoba**, the rich, flat, farming province in the west, is nearly three times the size of Great Britain. The capital is Winnipeg, situated at the confluence of the Red River and the Assiniboine, which comes from the west. This city is now also the place of convergence of numerous railways, and has grown rapidly as the trade centre for the wheat fields of the Prairies. Its population in 1881 was 8,000; in 1891, 26,000; in 1911, 136,000; in 1921, 180,000; in 1931, 219,000, and in 1951, 234,000. In 1881 the area under wheat in Manitoba was 51,000 acres; in 1902, 2,040,000; in 1903, 2,443,000; in 1908, 2,851,000; in 1918, 2,984,000; in later years 3m. acres was exceeded. But some of the wheat lands are now being converted to more intensive forms of agriculture, including dairying. Of the 25m. acres in Manitoba classed as suitable for arable farming about one-third is so used. The northern two-thirds of the Province lies on the Canadian Shield and has gold-zinc mines at Flin Flon and nickel at Lynn Lake. There has been much development of hydro-electric power. Manitoba has now its own ocean port in Churchill, linked by rail with the wheat lands.

(7) **Saskatchewan**, consisting of the greater part of the former districts of Assiniboia and Saskatchewan, together with the eastern half of Athanasca, was created a province only in 1905. It is still mainly a wheat-growing province, especially in the southern half; the northern half is a forest and mining region. In 1905, the area under wheat was 1,130,000 acres; in 1915, 8,929,000; in 1919, 10,587,000; in 1929, 14,445,000 (spring wheat only, winter wheat trifling). Now the total area under cultivation is 20m. acres—three-quarters under wheat. The manufactures, although still relatively unimportant, increased fifteen times in value between 1905 and 1926. Flax-growing has been encouraged, both for seed and fibre. The most important centres are the capital, Regina, Saskatoon, Moose Jaw, and Prince Albert. The south has vast lignite fields, the north has pitchblende in the Lake Athabasca region.

(8) **Alberta**, consisting of the former district of Alberta with the western half of Athabasca and strips of Assiniboia and Saskatchewan,

was also made a province in 1905. It originally owed its settlement to the advantages of cattle ranching offered by the natural pastures to the east of the Rocky Mountains, but has attracted agricultural settlers who grow oats as well as wheat, at first largely winter wheat. In 1905, the area under wheat was 107,000 acres (of which 32,000 winter wheat); in 1915, 2,138,000 wheat (40,000 acres winter); in 1919 the total wheat, 4,283,000 (41,000 winter); in 1929, 7,551,000 (128,000 winter). The latter figure is being maintained. No doubt the region benefits from the chinooks. In the south sugar-beet is grown under irrigation. The capital is Edmonton, on the Saskatchewan river, and at a point to which railways are giving increased importance. It had less than 5,000 people in 1901; in 1951, 159,000. As the oil-boom town its present growth is very rapid. The province is rich in coal, which is mined near Edmonton, at Anthracite, Mountain Park, Drumheller, Canmore, Lethbridge, and elsewhere. Natural gas is abundant and is used extensively, but oil is now the dominant interest. Calgary is now an industrial centre. Canada has paid much attention to the tourist industry and has established vast national parks. In the mountains of this province are the world-famous Jasper and Banff National Parks—the latter with the universally known resorts of Banff and Lake Louise.

(9) **British Columbia** is a province four times the size of Great Britain, comprising on the mainland the area from 350 to 400 miles in width between the coast and the Rocky Mountains, composed of high tablelands and lofty mountain ranges separated by deep and narrow valleys, but also including Vancouver Island and the coastal archipelago to the north as far as the Queen Charlotte Islands inclusive. Its wealth consists chiefly in minerals, forests, and fisheries. British Columbia produces about one-seventh of the mineral output of all Canada, a third of the forest output, and nearly a half of the fishery output. The discovery of gold first brought a rush of settlers here in 1856, but the deposits then discovered were worked out. Since 1895, however, gold, silver, copper, lead, and zinc mining have all been carried on. Lead, silver, and zinc are now mined in East and West Kootenay; copper near Howe Sound (Britannia mine) and near Princeton; auriferous copper ores are worked in the Rossland and Boundary district near the southern border of British Columbia; gold is however no longer worked in any of the once famous old localities. Coal is mined and converted into coke at Fernie in the Crow's Nest coalfield for use in the smelters, refineries, and fertiliser plants at Trail. Copper is also found on Texada Island, where there exist also deposits of iron ore. The oldest and most important coal-mines of the province are those of Nanaimo on the east side of Vancouver Island, and Cumberland, further north. Coal is also mined in the Nicola Valley and in the country traversed by the Tulameen and Similkameen

rivers. The province has vast water power resources. Special interest attaches to the Kitimat scheme, not only because it is creating an aluminium smelting town in what was formerly almost uninhabited forest country but also because the water is brought through a tunnel in the coast mountains. British Columbia is steadily advancing to the front as an agricultural province with the aid of irrigation. The rich valleys and lowlands in the interior offer favourable conditions for fruit-growing and dairying. Of these the Okanagan valley contains the largest area of fruit lands in the province. Apples of excellent quality are exported in large quantities to the English and other markets, and peaches, plums, apricots, and vines are successfully grown. The forests of the Coast Mountains, composed of gigantic Douglas fir, cedar, and other trees, are among the grandest in the world. The capital of the province is Victoria, on a beautiful harbour at the south-east end of Vancouver Island. It has a considerable *entrepôt* trade. Any vessel passing through the Straits of Juan de Fuca on its way either to Vancouver or Seattle must pass Victoria and the majority call. Esquimalt, on an excellent harbour adjacent to that of Victoria, has an arsenal and graving dock. Vancouver, whose harbour, formed by Burrard Inlet, can accommodate the largest liners alongside the wharves, and New Westminster, near the mouth of the Fraser river, are the western termini of the two great trans-continental railways. The quickest sea-land route from London and New York to the Far East is *via* Vancouver. New Westminster, a lumber port, suffers from the sand bar which persists in forming across the mouth of the Fraser River, giving only a few feet of water at low tide. Since the opening of the Panama Canal Vancouver has become a centre for shipment of lumber and metals as well as prairie wheat for Europe and the east of America, later also to eastern Asia (the Orient) as the following table shows:

WHEAT EXPORT FROM VANCOUVER IN MILLIONS OF BUSHELS

	1920-21.	1921-22.	1922-23.	1927-28.	1952.
Europe . . .	0.5	4.06	14.86	} 79.0	117.36
South America . . .	—	—	0.33		
Orient . . .	—	3.44	3.83		

Vancouver in 1891 had a population of only 14,000. By 1911 this had increased to 100,000, and now the population of 'Greater Vancouver' is over 531,000 (1951). Prince Rupert, the port on Kai-En Island, is a terminus of the Canadian National Railway (formerly Grand Trunk Pacific). A large dry dock was opened here in 1921. It is about 3,860 nautical miles from Yokohama, 500 miles nearer than any other Pacific port. Recent developments include the new process of fish freezing.

(10) **Newfoundland.** Newfoundland was formerly a separate British Dominion, to which belonged not only the island of that

name but also the dreary coast and a considerable inland tract of Labrador. Owing to financial difficulties the government of the United Kingdom assumed responsibility for the government and finances of Newfoundland in 1933. Later, in 1949, the country joined Canada as the tenth province. The present population (under 350,000) is chiefly composed of fishermen, settled on the coast. The island is known, however, to be rich in minerals, especially iron ore, as well as in timber. There are unworked coal-fields, situated in the south-west, being a continuation of those in Cape Breton Island. A railway has been made from St. John's, the capital of the island, on the east coast, through country adapted for agricultural settlements as well as through the coal-fields, to the west coast. Iron ore of excellent quality is now mined with remarkable ease on the small island known as Bell Island in Conception Bay, within eighteen miles of St. John's. These Wabana deposits, as they are called, contain on the average about 54 per cent. metallic iron, and are comparatively free from deleterious ingredients. They pass from the island under the sea, and the amount of ore on the island was estimated by Mr. Howley, director of geological survey of Newfoundland, in *The Iron Resources of the World* (vol. ii, p. 272), at about 113m. tons, with a possible submarine reserve of 3,523m. tons. There are large paper and pulp mills at Grand Falls and Cornerbrook.

Northern Canada. The remainder of Canada is divided into the Northwest Territories—three separate districts of Franklin (the northern islands), Keewatin, and Mackenzie—and the Territory of Yukon. They all yield fur, and the Yukon territory is rich in gold and silver. It is here that the Klondike gold-field, on which Dawson City now stands, was discovered in 1896. Access to the region is facilitated by a mountain railway from Skagway, over the White Pass, to a navigable river of the Yukon basin. The gold occurs both in alluvial deposits and in quartz, but the most easily worked deposits are exhausted. The production of gold in the Yukon district increased from a value of about £60,000 in 1896 to £500,000 in 1897, and £4,450,000 in 1900, then decreased to less than £1m. in each of the three years 1907–9. In 1930 the value was £136,000. The population dropped from 27,000 in 1901 to 4,000 in 1931, and Dawson City has less than a thousand people. Oil-fields were discovered in the Mackenzie river district in 1921. There are some who are convinced of the value of Canada's 'Arctic Prairies' and herds of reindeer were driven into this area from Alaska in the years 1932–36.

The great north is developing in other ways. There are silver-lead mines at Mayo, radium, uranium and silver deposits near Great Bear Lake, and gold-fields at Yellowknife. The ubiquitous aeroplane and caterpillar tractor now link all developed centres in this northern region.

During the Second World War United States Army engineers constructed the Alcan or Alaskan Highway from the Peace River area (and so from Edmonton) to Alaska through the mountainous heart of the northern forests and across southern Yukon.

TOWNS OF CANADA, 1951

Montreal . . .	1,003,000	Edmonton . . .	159,000
Toronto . . .	671,000	Calgary . . .	127,000
Vancouver . . .	531,000	Windsor . . .	121,000
Winnipeg . . .	234,000	Victoria . . .	104,000
Ottawa . . .	202,000	London . . .	93,000
Hamilton . . .	192,000	Halifax . . .	86,000
Quebec . . .	164,000	Regina . . .	71,000

ST. PIERRE AND MIQUELON. A group of rocky French islands off the south coast of Newfoundland; total area 93 square miles. The population (5,000) is dependent mainly on the cod-fishery, with fox-farming as a secondary industry.

BERMUDA

The Bermudas are a group of small islands about 750 miles to the south of Nova Scotia lying in the path of the Gulf Stream and hence producing tropical and temperate fruits and vegetables, and frequented by invalids for the sake of their equable climate. Indeed, a great development of the Bermudas as health and pleasure resorts has taken place in recent years. They lie within two days of the United States coast (677 miles from New York) or a few hours by air. Their strategic position is obvious, hence the lease of land to the United States for naval and air bases in addition to those of Britain. The area is about 21 square miles.

UNITED STATES¹

The compact territory of the United States, between Canada and Mexico, extends over an area of about 3m. square miles, or more than thirty-three times the area of Great Britain. Physically this territory is a continuation of that of Canada. In the west the mountains of British Columbia are prolonged into Washington, Idaho, and Montana. In the middle the plains and prairies are similar in the two countries, and the south-eastern highlands of Canada form the northern extremities of the Appalachians. Almost the entire population of the United States is of non-American origin, being composed either of immigrants or descendants of immigrants from Europe, or of descendants of African negroes originally introduced as slaves on the southern plantations. It is in a large measure due to this cause, and to the fact that the development of the population has from the first depended in a great measure on commerce with Europe, that the density of population is still

¹ We are greatly indebted to Dr. G. M. Wrigley for comments on this section.

greatest in the east, and above all in the vicinity of the great seaports from Massachusetts Bay to Chesapeake Bay. There is, however, a steady movement of the centre of gravity of the population towards the west and the movement was one degree of longitude or more for each decennial census from 1810 to 1901. It is now as far west as Indiana.

Until recently there was no other region in the world with so vast a field for immigration under the existing economic conditions, and hence no other state has had its population steadily reinforced by so abundant a stream of foreign settlers. In the ten years 1877-86 the total number of immigrants was upwards of 4.2m. and in one year (1882) the number approached 800,000. In two years the number of immigrants from Europe exceeded 600,000. Till near the end of the eighteenth century the United Kingdom furnished the largest contingent of immigrants from the earliest date from which statistics are obtainable, but from about the middle of the nineteenth century the German total approached and occasionally exceeded the British. In later years a change took place in the character of the immigration. In the ten years ending June 30, 1890, the United Kingdom and Germany together furnished rather more than 55 per cent. of the immigrants; in the ten ending June 30, 1910, less than 14 per cent.; the contingents supplied by Austria-Hungary, Italy, and Russia (including Poland) in the latter period were equal to 24½, 23, and 18 per cent. of the total respectively. In the four decades ending with June 30, 1880, 1890, 1900, and 1910, the total number of immigrants in millions was 2.8, 5.2, 3.8, and 8.8. In the last five years before the First World War, that is, the five ending with June 30, 1914, the number of immigrants was 5.2m., in the next five, 1.2. Immigration of any nationality was restricted for 15 months beginning April 21, 1921, to 3 per cent. of the population of that nationality in the country at the census of 1910. Under the quota thus initiated the last inter-war year of large immigration was 1923-24 (241,709). During the great depression with consequent unemployment which followed, immigration fell greatly—to a minimum of 23,068 in 1932-33, a figure far exceeded by the emigrants. After the Second World War there was a large influx of 'displaced persons' from Europe. The position is illustrated by 1949-50 when 249,187 alien immigrants were admitted against 27,598 leaving. Of the arrivals 58 per cent. were German and Austrian, 7.5 British and Irish, 5 Italian. Between 1820 and 1950 a total number of 39,325,500 alien immigrants entered the United States. A large number of the non-European immigrants are from Canada, and hence in the first instance likewise of European origin. Chinese immigration was at one time considerable (380,000 were admitted between 1820 and 1934), but is now practically prohibited. The same was true of the Japanese of whom

277,000 were admitted but have been repatriated. The negro population, though not recruited by immigration, is multiplying rapidly by natural increase (excess of births over deaths), but the small native Indian population is dwindling away or becoming absorbed. In 1900 the negro population of the United States (almost confined to the south-east) was 8,841,000, as against 7,489,000 in 1890; in 1910, 9,828,000, both showing a lower rate of increase than the general average of the population. In 1920 the figure was 10,463,000, the rate of increase 1910-20 being 6.5 per cent. The natural increase of the white population (excluding immigrants) was 11.6 per cent. for the same decade. In 1930 the total was 11,891,000 against 108,864,000 whites and 2,020,000 other races (mainly Mexicans and Indians). In 1940 the total population of the continental United States reached 131,669,275 and in 1950 150,697,000 (135,215,000 whites and 14,894,000 negro). The 1940-50 intercensal increase of 19,027,725 was the largest ever recorded and included 1,035,039 immigrants. The influx of Puerto Ricans, who are U.S. citizens and can move freely, has caused difficulties, especially in New York.

In relation to the commerce of this vast region, it is highly noteworthy that there are special circumstances both in the history of the country and in the physical features of its territory, that have favoured the unity of its government. In consequence of this unity there is free trade here, as in Canada, from ocean to ocean; and though the individual states have each legislative powers within certain limits, there could be no more striking illustration of the importance to commerce of the central government than the passing, in February 1887, of the Interstate Commerce Act, which may be briefly described as an Act prohibiting local and individual preferences on the greater highways of commerce throughout the length and breadth of a territory four-fifths the size of Europe.

If we look at this unity of government from an historical point of view, there are several important considerations to bear in mind. The separate 'plantations' or colonies that ultimately formed the first United States grew up independently from several convenient starting-places, like the Australian colonies and the republics of South America. They grew up under English influence indeed, and with a common language, but this would not in itself have sufficed to make them one, and it was perhaps fortunate that when they had become strong enough, they were united in a common war against the mother country; fortunate, too, that, when that war was over, the common burdens which it entailed necessitated a common government, and that the great state thus formed held such a preponderance in the middle of the continent that it easily acquired in course of time all the present territory by settlement, purchase, or conquest. And it was likewise fortunate that, when the practice of

slavery in the southern states threatened a permanent division, the North should have been strong enough, in virtue of its more rapid development by immigration, to conquer the South by mere force of wealth and numbers (1861-65). In the course of this war the slaves of the seceding states were declared free by proclamation of the President of the Republic, and immediately after the conclusion of the war an amendment to the constitution of the United States abolishing slavery throughout their territory was adopted.

Physically the circumstance most favourable to union is the fact that the central region is one great plain communicating freely with other plains and lowlands in the east, and in the west sloping imperceptibly up to the tableland which forms the base of the Rocky Mountains, and that this great central plain is traversed by some of the grandest navigable rivers in the world. Though this factor became of minor significance after the development of the railways, it was of the greatest significance earlier. The eastern and larger portion of this central region, from about 100° or 101° W., has a fertile soil and adequate rainfall, so that everything has combined to favour continuous and progressive settlement. As settlement went on nearly every part of it has had the great advantage of easy communication with other neighbouring settled districts.

The Mississippi, the great waterway running north and south through this region, is continuously navigable for steamers of considerable size to Minneapolis at the lower end of the rapids below the Falls of St. Anthony, on the parallel of 45°, that is, to within four degrees of the northern frontier. The portion of the river from this point to St. Louis is spoken of as the Upper Mississippi. The river traverses a region in which the products of temperate and sub-tropical climates are brought closer together than in any other part of the world, and, before the introduction of railways, formed the principal channel of communication between districts with the diverse wants due to diversity of production. To-day there is little traffic and it is difficult to believe that in the year 1887 more freight was carried on the Upper Mississippi in eight months than any of the three great trunk lines of railroad carried in a year, and at about one-third the rate. The navigation of the lower river was naturally even more important, especially below Cairo at the confluence of its great left bank tributary the Ohio, which is navigable for steamers drawing up to 9 feet at all times in the year, as high as Pittsburgh (in about the same latitude as New York), where the river is formed by the union of two other navigable streams. There is only one interruption in the form of rapids, avoided by a short canal at Louisville, and for small steamers these rapids are not insurmountable. To St. Louis, about 1,270 miles above New Orleans (though only 600 miles direct), vessels drawing 16 feet can ascend during the high stage of the river, which usually

begins in May or June and lasts for about three months, but the bulk of the business was done in boats of 8 feet draught or less. Besides the disadvantage of a very winding course the river suffers from unstable banks. Even in the quietest state of the river land-slips are constantly occurring, and the population on its immediate banks is relatively small. On the other hand, traffic was promoted by heavy cargoes collected on the banks of the river and its feeders—Pittsburgh coal, as already indicated, and elsewhere timber, for which St. Louis and Cairo were great storage places. In illustration of the importance of this navigation it may be mentioned that a 'tow-boat' (or stern-wheel steamer used for propelling cargo boats) has been known to proceed down the stream from Louisville, pushing before it thirty-seven barges with a total cargo (including that of the propelling steamer) equal to nearly 26,000 tons, and by this system coal used to be carried from Pittsburgh to New Orleans, a distance of 2,000 miles, at the cost of about 60 cents, say 2s. 6d., per ton, equal to .015d. per ton per mile. The river traffic dwindled in face of railway competition, but later the Federal government resolved to promote the revival of river traffic as a relief to the then congested railways. In 1918 it voted 8m. dollars for the improvement of the Lower and 3.6m. for that of the Upper river. Unfortunately the bulk of the internal commerce now moves from east to west, whereas the river flows from north to south.

The Cumberland and the Tennessee, on the left of the Ohio, and the Wabash on the right, have likewise considerable stretches of navigable water. The Red River, the Arkansas, and the Missouri, the great right-bank tributaries of the Mississippi, are also all navigable for hundreds of miles, the Missouri for more than two thousand miles, steamers being able to ascend it uninterruptedly to the Great Falls, about 100 miles below the gorge known as the Gate of the Rocky Mountains. With the advent of railways traffic declined and there has, actually, been no commercial traffic on the Upper Missouri since the nineties of last century. In the same great plain, but outside of the basin of the Mississippi, the Red River of the North, which flows northwards into Canada, is navigable for steamers to Fargo, a point about 200 miles in a direct line from the limit of continuous navigation on the Mississippi.

The Appalachian Mountains in the east, and the Rocky Mountains and other chains in the west, form an interruption to communication in this, among other ways, that they cause the rivers which cross them to have their navigation interrupted by rapids. It is partly on this account, partly on account of their smaller size, that the rivers of the Atlantic coast are of less importance than those of the great plain as navigable streams; but it must be remembered that some of them (the Hudson, Delaware, Susquehanna, Potomac, and James river) are of great value to commerce as forming, like

the rivers of the British Isles, fine harbours in their estuaries; and the inland navigation of the Hudson, a broad, deep river, navigable for large steamers to the latitude of the Catskill Mountains, for smaller ones to the falls at Troy, is of great importance, and was the first cause of the growth of the greatest of all American seaports (New York).

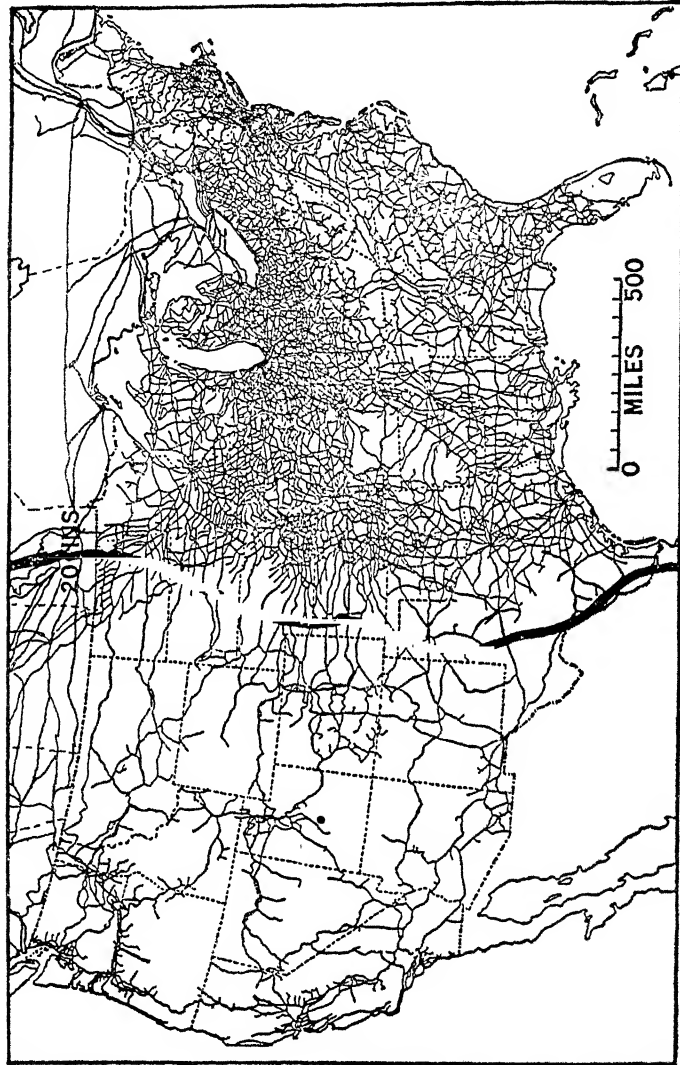
The Columbia river, the principal navigable stream belonging to the Pacific drainage of the United States, has its navigation frequently interrupted by falls and rapids, and so too has its chief United States tributary, the Snake River. On the main stream, the lowest interruption of this nature is the Cascades, 165 miles from the mouth, but costly works allow of navigation being continued past this obstruction.

The obstacles presented to the laying of railways by the great mountain chains in the east and west are less perhaps than might have been expected from the extent and height of the mountains. The gradual slope of the ground up to the base of the Rocky Mountains facilitated the laying of railways to the foot of the passes, and several routes were found by which railways could be advantageously laid across these and other western mountains (cf. p. 735).

In the case of the Appalachian Mountains (that name being now used as a general term for all the mountain ranges in the east), it is an important physical feature of the United States that in the north-east—precisely where population is densest, coal and anthracite most abundant, the connections between east and west most important—that system breaks up into a great number of smaller mountain ranges with many gaps between them, facilitating railway and canal construction. In the southern part of the Appalachian system, that to which the name of Alleghany Mountains is sometimes confined, the ranges are higher and more continuous, and there is still a stretch of nearly 300 miles with only one railway across it, and immediately to the west of that stretch there lies one of the most sparsely peopled districts of the eastern states.

Today, a change is taking place in the railway network depicted overleaf. Many branch lines are being closed down and the rails taken up. Other lines now have no passenger services, being used for freight only. In large measure this is due to road competition, reinforced by airline competition for both passengers and goods, and also pipeline competition. Even as long ago as 1939 out of all the freight moved in the United States, measured in ton-miles, the railways were only handling 50 per cent. compared with coastwise shipping 25 per cent., Great Lakes shipping 10 per cent., pipelines 7 per cent., highways 6 per cent., and inland waterways 2 per cent. In recent years the railways have lost further ground and new developments are in progress, such as the movement of powdered coal suspended in water by pipeline, and the use of long conveyor belts. Air transport has gained enormously.

To the northern Appalachian system belong several of the most serviceable canals of the United States, among others the Erie and Champlain Canals. The Erie Canal, laid through the Mohawk



RAILWAYS OF THE UNITED STATES AND CANADA. NOTICE THE NETWORK IN THE WETTER EAST

valley, serves to connect the navigation of the Great Lakes with New York, starting from Buffalo at the eastern end of Lake Erie, and proceeding eastwards to Troy and Albany on the Hudson. It was opened in 1825, and the fact that New York then first came to exceed Philadelphia in population, will serve to give an idea

of its importance at that date. Its largest dimensions on the old route admitted of barges of at most 250 tons. The new Erie Canal, 12 feet deep, passing through Oneida Lake, adapted to barges of 1,000 tons, was opened in 1918. Its western termination on Niagara river is at Tonawanda, from which point connection is established with Buffalo, partly by the river, partly by the Black Rock Canal, which has a depth of 22-23 feet, opened in 1914. The Champlain Canal connects the eastern end of the Erie Canal (now called the New York State Barge Canal) with the head of Lake Champlain, and thus completes the waterway between New York and the St. Lawrence. The Cape Cod Canal, opened in 1914, cutting across the hook-shaped peninsula in the east of Massachusetts, reduces the distance between Boston and New York from 334 to 272 miles, and enables vessels to escape the risks of the voyage round the Cape where wrecks used to average 35 a year. Its depth at mean low water is 25 feet.

After the construction of the Erie Canal the fertile lowlands of the Mississippi basin had the advantage of two great waterways in communication with the ocean, and more or less competing with one another and affecting the competition of railways running in different directions. Although the grain traffic by the old Erie Canal declined very rapidly,¹ this did not prevent it from having a great influence on the cost of carriage.

The physical features that favoured the construction of the two waterways from New York are still of great importance for the railway connections of that port. The Hudson and Mohawk valleys allow of railway connections with easy gradients between New York and Chicago (the 'sea-level' route of the New York Central Lines), and at one time this was the only route for the great expresses between these two cities, even although in following this route one has to run for 140 miles north before turning westwards. This route still competes easily with the more direct but more difficult route through the Alleghany Mountains. It is these physical features which no doubt have enabled New York to beat Boston in competing for the bulk of the traffic with the important hinterland of which Chicago is the centre. Boston is cut off from that hinterland by the Hoosac Mountains in the west of Massachusetts, through which there was no railway tunnel till 1875. Even now that route appears to be a difficult one, for a large part of the traffic

¹ In 1886 the cost of carriage of a bushel of wheat from Chicago to New York was 16·5 cents by an all-rail route, 12 cents by lake and rail, and only 8·71 cents by lake and canal. In that year upwards of 45 millions of bushels of grain and flour were carried through the Erie Canal. In 1900, the corresponding rates were 9·98, 5·05 and 4·42 cents, but the total movement of wheat on all the New York State Canals (of which the Erie Canal is one) declined from 37·6 millions of bushels in 1862 to 4·6 millions in 1900.

of Boston with the west passes through New York. While the Hudson and Mohawk valleys afford an easy route between New York and the west, the Hudson, Lake Champlain, and Richelieu valleys afford an equally easy route running almost in a straight line due north between the Adirondacks and the Green Mountains to Montreal.

With regard to **climate**, we have in the United States, as in Canada, to note differences as well as resemblances in comparing different parts of the country with corresponding parts of Asia and Europe. The continuous territory of the continental United States, that is, the territory belonging to it on the mainland of North America exclusive of Alaska, may be divided into four climatic regions with characteristic products, two east and two west of the meridian of 100° W., though the boundaries must be recognised as more or less arbitrary.

The main agricultural products of the United States are mentioned under the four sections into which this vast country is divided below, but two general observations may here be introduced. Professor Russell Smith has pointed out long ago that both in the north and south of the United States, crops like maize, cotton, and tobacco are widely grown, which, unlike the prevailing European cereals, do not cover the surface, and thus leave much soil between the plants liable to be washed away. The problem of soil erosion and of the disastrous floods which result from the rapid run off from the eroded surfaces has become a matter of the most serious import in the last few decades, so that the Federal government set up a special service to deal with the subject. The development of agriculture in the United States during the twentieth century is in marked contrast to that in the nineteenth. In the nineteenth century we saw an expansion, a movement westwards, especially after the Civil War of 1861-65. In the twentieth century the progress has been along three lines: (1) reclamation by drainage, irrigation, and other means; (2) the more active and constant use of good land already worked; but the elimination of farms established in unfavourable positions on 'sub-marginal' land, *i.e.* beyond the pioneer 'fringe'; and (3) more intensive cultivation and organisation. Dr. O. E. Baker has distinguished in the United States a number of agricultural regions which may, however, be grouped together roughly in the old four main divisions distinguished by Chisholm.

A. The North-east. This region lies north of the Ohio and Delaware Bay, and comprises, among others, the New England States. It corresponds with the same latitudes of eastern Asia chiefly as regards extremes of temperature, for it has not the typically dry winters of the corresponding parts of Asia. In this region the inhabitants are almost all of European origin, and the products are similar to those of Europe. The eastern portion of it is the most

densely peopled part of the United States, and that in which manufacturing industries have long been most highly developed. The western half of it is the great maize- and wheat-growing portion of the country; the north-west including the Red River valley. According to Baker's scheme, it includes a north-eastern hay and dairying region and then the great corn belt, with a belt of intensive vegetable or 'truck' farming along the Atlantic coast.

B. The South-east is a region in which cotton, maize or corn, and tobacco are grown as staples. The climate, though not generally good for wheat, is well adapted for maize and warm temperate or even sub-tropical plants, including the ground-nut, or, as it is more commonly called in America, the pea-nut, the American representative of the walnut known as the pecan nut,¹ and, in the far south, in spite of occasional disaster, even the orange. Negroes in this region form a large proportion of the population in the states on both sides of the Lower Mississippi, even outnumbering the people of European descent. Here the correspondence with the same latitudes in the east of Asia as regards rainfall is closer. There is for the most part a decided preponderance of summer rains, though the winters are far from rainless. The difference as regards temperature in the parts exposed to northerly winds is already noted on p. 726. The growth of arable farming in the sandy 'pine barrens' as they are called, which occupy a large portion of the coastal plain from North Carolina to the Lower Mississippi (a process of reclamation facilitated, it should be mentioned, by the neighbouring supplies of phosphatic fertilisers), is a notable feature. This region comprises Baker's sub-tropical belt, along the shore of the Gulf of Mexico and covering Florida, then his great cotton belt which is succeeded to the north by the corn and winter wheat belt.

C. The region between 100° and 120° W. (mostly tableland), comprising an area of about 1·2m. square miles, may be described as the arid region of the United States, inasmuch as throughout its extent except in the neighbourhood of mountains, and near the northern frontier, the rainfall is too scanty for agriculture without irrigation. Here, therefore, we find the great majority of the irrigation schemes of the United States as shown on the accompanying map. This region corresponds in the north to the southern part of Western Siberia, and in the south to the arid and almost rainless tracts of Asia forming Soviet Central Asia. The part of this region lying east of the Rocky Mountains and sloping gently eastwards is known to American geographers as 'the plains' or short grass prairies. It is a sheep and cattle rearing region. The western part, consisting of mountains and tablelands, is rich in metallic minerals.

¹ The fruit of a species of hickory, genus *Carya*, which is closely akin to the walnut, genus *Juglans*.

D. The Pacific Coast has a climate very closely corresponding to that of the same latitudes in the west and south of Europe and northern Africa. In the north the rains are very abundant west of the mountains, and the climate compares with that of north-western Spain or France. As we pass southwards we come to a climate closely resembling that of the Mediterranean region, the summers nearly rainless, the winters mild. The difference between the coastal climate with low summer temperatures due to the prevalence of fogs, and the climate of the Great Valley of California with a lower rainfall but higher temperatures, should be carefully noted. Gold, which first attracted a large population to this part of the world, is still an important product, but the fine Californian valley, watered by the Sacramento in the north and the San Joaquin in the south, now teems with wheat, barley, grapes, and southern fruits, and excellent wheat is also grown on both sides of the Columbia River, and on the Snake River Plateau, as well as in the valley of the Willamette, between the Coast and Cascade Ranges. In southern California various fruits and even wheat and barley are grown by irrigation, the water for which is obtained mainly by means of canals, though some water is obtained from wells. The earliest recorded canal was opened in 1835; the first in the Anaheim district in 1856. Nearly all the oranges and other citrus fruits are grown above the valley floors, which are less liable to fogs and frosts than the low grounds. The fruits of California—oranges, grapefruit, lemons, apricots, prunes, raisins, and dried peaches—furnish, along with rice, vegetables, and wool, the great bulk of the eastward traffic of the middle and southern trans-continental railways. On the mountains the forest scenery is highly remarkable. Dense forests of giant conifers cover the slopes, and a great timber trade has grown up round Puget Sound (Washington), at Seattle, Tacoma, Bellingham, and other ports.

The changing **foreign trade** of the United States will be most conveniently studied in detail with reference to the tables given below. In examining these tables two considerations must be borne in mind. In the first place, the foreign commerce of the country is greatly affected by the maintenance of a customs tariff calculated to foster native industries, in consequence of which there is an immense amount of manufacturing industry for home consumption of which these tables give no idea. Secondly, it must not be inferred that because certain agricultural products are largely imported into the United States, they could not be home-produced. The high cost of labour in the country excludes or limits the production of certain commodities, such as sugar (to some extent), tea, and raw silk, for which the climate of the United States in some part of their territory is in no way unsuited.

The table of exports suggests the inference that the United States remained on the whole pre-eminently an agricultural country, at least till the First World War, and this is still largely true notwithstanding the immense increase in recent years in the number of those engaged in manufactures and mechanical and mining industries. A comparison of the period 1881-85, the first after the Civil War in which figures could be obtained fairly comparable with those of other countries, with the period of four years ending June 30, 1914, shows that the exports of machinery, iron and steel wares, leather and cottons increased from an aggregate of 5.6 per cent. of the total value of the exports to 21.6 per cent. of that value. By 1926-30 manufactures had increased to 39.5 per cent. of the exports. But the years of the Second World War and after forced the United States to realise that a hungry world needed the food she could easily produce by a more intensive use of land.

The area under wheat in the United States as a whole remained practically stationary for the years from 1880 to 1896, whilst the area under maize grew rapidly. The extent of land occupied by this crop in 1909-13 was more than twice as great as that under wheat, and its produce about three times as much as that of the latter. The acreage of wheat then began to expand rapidly and now is not far short of that of maize. The much smaller export of maize than of wheat is due to the fact that the bulk of the former crop is employed in the United States in feeding swine and other animals, so that the production and export of bacon, hams, lard, cattle, and beef, as well as maize, may all be regarded as representing this branch of American agriculture. The development of 'hybrid corn' in the nineteen-thirties and forties led to a spectacular increase in yield.

The timber export of the United States takes place mainly from the Pacific states of Washington and Oregon. In the other forested areas, cut now exceeds growth, and large timber is practically exhausted. Pensacola, 55 miles east by south of Mobile, is the chief place of export of famous pitch-pine from the sandy 'pine-barrens' of Florida and the neighbouring states.

Cattle are most numerous in the United States east of the meridian of 100° W., especially in the states occupying the northern part of the basin of the Mississippi. Dairy farming is carried on in New England and south of the Great Lakes, notably in Wisconsin; pig-rearing in the maize belt south and west of Chicago. It is in the western states, however, that sheep are most numerous relatively to population, the drier climate there prevailing being favourable to the rearing of that animal, but the total number of sheep is limited. Sheep, moreover, are now being reared more for meat than wool, and the merino is tending to disappear.

Among the agricultural deficiencies of the United States, which the import table betrays, attention may be drawn to two, sugar and

coffee. Sugar, except for a few years, has held the first place among the imports of the United States over the past century. There is, however, a considerable home production, especially in Louisiana of cane-sugar, and beet-sugar in various states such as Colorado and Michigan. The ordinary fruits of the colder temperate climates flourish in the United States as well as in any part of the world, and are produced in sufficient abundance to leave a surplus for export. There was formerly a large import of Mediterranean fruits; of these a large supply is now home-grown in California and Florida and the surplus has become a very important item of export. It is indeed characteristic of development in the United States that, one by one, commodities previously imported have been replaced by home production. Where home production has not proved possible substitutes have been developed, *e.g.* artificial rubber for natural rubber, rayon for silk, and so on. On the other hand bananas are imported in large quantities from Central and South America and the West Indies. Coffee has always been a leading import since Americans are essentially coffee drinkers and not tea drinkers. A good deal of rice is grown in the swamps of Louisiana and latterly under irrigation in southern California.

The **mineral resources** of the United States are enormous. Besides coal and petroleum, the United States now produce more iron, copper, zinc, lead, and aluminium, than any other country, in addition to being second or third amongst the producers of gold and silver.

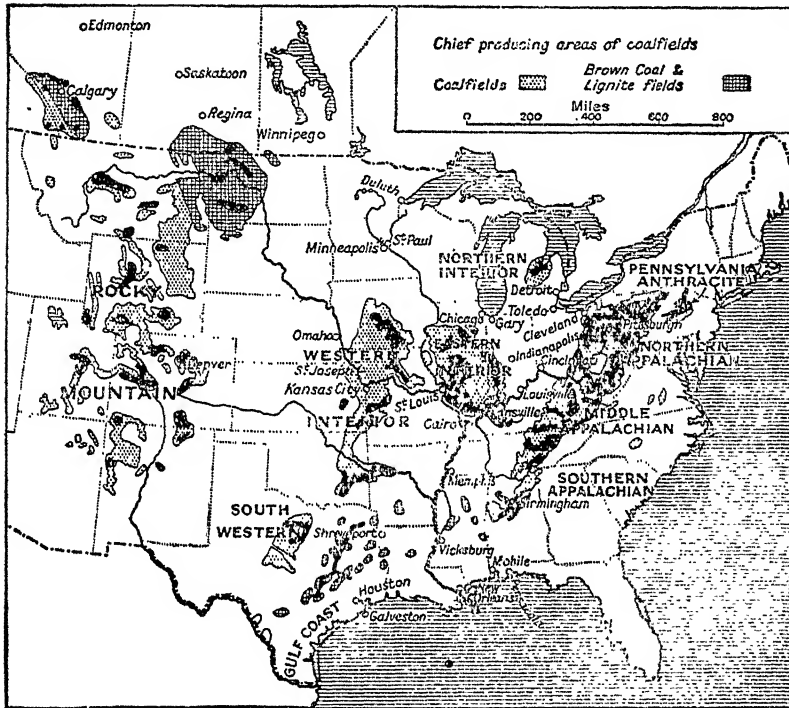
Reference is made elsewhere (see pp. 111 and 287) to the fact that the major industrial regions have grown up for the most part away from coalfields. This trend continues. Amongst the significant developments associated with the Second World War was, and since the War has been, the growth of manufacturing on the Pacific Coast. Los Angeles has grown with extreme rapidity and handles a very great variety of both heavy and light industries. Special interest attaches to the great aircraft industry of California. In the north-west Seattle has also been developing rapidly.

Another area of very marked development in varied manufacture has been in the Gulf states of the South.

Any account of American industry based on the exploitation of minerals and the use of power ignores what is probably the greatest of all industries—the tourist industry. However remote they may be, the great National and State parks of special scenic beauty and interest are visited by tens of thousands annually, and it is the private automobile, not the freight truck, which necessitates ever-increasing road development.

Coal is produced both in the form of anthracite and bituminous coal, as well as lignite. The total production increased with very rapid strides during the latter part of last century. The production

of 1886 was more than three times that of 1870, and more than seven times that of 1860. In the present century the output has remained relatively constant owing to increased competition of oil and water-power. The great Appalachian fields, lying in the eastern states, yield 70 per cent. of the output which, apart from the years of depression, averages 500m. tons or a third of the world's total. The largest producing state is Pennsylvania with a quarter of the coal and most of the anthracite. Anthracite is produced in several



THE COALFIELDS OF THE UNITED STATES

small fields in the east of the state, the centre of the region of production being about 200 miles from New York and 125 miles from Philadelphia. Access is afforded to the productive region by the valley of the Delaware, with those of its tributaries, the Schuylkill and the Lehigh, and in all of these valleys there is water communication (by canal or river), as well as, of course, abundance of railways. Bituminous coal is produced chiefly in the west of Pennsylvania, the large manufacturing town of Pittsburgh being situated about the centre of production. To this region belongs most of the coal used in making coke in the United States; a leading centre of coke-making

being Connellsville, about 40 miles south-south-east of Pittsburgh. The Clearfield coal-field, situated to the north-east of the Pittsburgh area nearly due west of New York, supplies the best steam-coal in the neighbourhood of the northern Atlantic ports. The bituminous coal region of western Pennsylvania likewise extends into the adjoining states of West Virginia and Ohio, in the latter of which quantities of coal are produced in the neighbourhood of the Ohio River. The Pocahontas coal-field, on the borders of Virginia and West Virginia, furnishes the best of all American steam-coal, to a limited extent exported by way of Norfolk and Newport News. Farther west another productive coal region extends from the west of Indiana through Illinois to the east of Iowa; and Illinois ranks after Pennsylvania and West Virginia in the total amount of its production. Among the Appalachian ranges in eastern Kentucky and Tennessee and northern Alabama, are other coal-fields or actually other parts of the great Appalachian field, with a rising production, and many others are scattered over different parts of the United States territory. It will be noted that the Pittsburgh coal is conveniently placed for shipment over the Great Lakes to Canada, but not one of the United States fields is situated so conveniently for the export of coal as those of Britain. Details of the utilisation of American coal are given above (p. 258).

The **iron ores** of the United States are likewise very abundant and very widely distributed. Many of them also are of excellent quality. But the chief supplies of ore are at a great distance from the smelting fuel. Nowhere in the country are the best steel-making ores found in proximity to smelting coal. The Lake Superior region, which in recent years has yielded five-sixths of the iron ore produced in the United States, is, however, conveniently situated to the Great Lakes, which facilitates cheap transport by water. Of the iron-ore ranges near that lake the first discovered was the Marquette Range in Michigan. It has been worked since the year 1885. The Menominee Range, a little to the south, was discovered in 1877, the Vermilion Range in Minnesota, in 1884, the Gogebic in Wisconsin in 1885, and the Mesabi in Minnesota not till 1892. This last discovery is the most important on account of the extraordinary facility with which the ores can here be worked. The deposits were originally covered merely with a skin of glacial drift. This having been removed, railway lines are laid to the ores, and these having been loosened by blasting when necessary, are then dug and loaded on the trucks by steam-shovels. There is then a short downhill haul to the lake ports of Duluth, Superior, and Two Harbors. It is in a large measure the development of these and other mineral areas, together with that of the agricultural and more particularly the wheat region to the north-west, that led to the huge traffic through the Sault Ste. Marie canals.

For smelting, the general rule prevails in the United States, as elsewhere, that the ore is brought to the fuel, rather than the fuel to the ore. It is for this reason that the great centre of the iron industry of the United States is Pittsburgh, which in the early stages of the industry had the advantage of local supplies of ore as well as coal; and had likewise the advantage of being situated where two navigable streams unite to form the Ohio. Some of the local supplies were long ago exhausted, and their total amount is scanty, but Pittsburgh still has the advantage of fuel in a higher degree than any other town in the United States; for not only is it within easy reach of the Connellsville coke, but it was likewise one of the early centres of the trade in petroleum. For several years also its iron, glass, and other industries dependent on fuel had the advantage of natural gas, which issues from the ground in the vicinity, and was conveyed to the city by pipes. With the increase in price this gas was mainly used for domestic purposes and now finds its greatest use in the localities where found. Pittsburgh produces about one-fourth of the pig-iron made in the United States, and carries on all branches of the iron and steel industry to a greater extent than any other city in the country. The chief supplies of ore to Pittsburgh are now brought from the Lake Superior region. Pittsburgh was an early witness of large-scale amalgamations. In 1900-01 numbers of the most important iron and steel-working companies were united in a great trust with a capital of above £230m.—the great United States Steel Corporation. There were no fewer than thirty-eight plants belonging to this trust at different points on twenty-six miles of navigable water (the Ohio, Allegheny, Monongahela, and Youghiogheny) with Pittsburgh as a centre, and there were numerous other plants belonging to it on the borders of the states of Pennsylvania, New York, and Ohio between Pittsburgh and Lake Erie. The trust also owns vast coal-fields, including the Pocahontas coal-field, extensive deposits of ore in the iron ranges in the United States round Lake Superior, railways connecting these ranges with the lake, railways connecting establishments belonging to the trust in and round Chicago, and a railway connecting Pittsburgh with the lake-ports of Conneaut (Ohio) and Erie (New York). In the making of glass the employment of natural gas was as beneficial to the quality of the product as in the making of iron, and from the same cause, the absence of sulphur. At a trial of window-glass made from coal and from gas-fuel at Pittsburgh it was found that newspaper print could be read through eighteen sheets of gas-made glass placed behind one another, whereas nothing could be seen distinctly through six sheets of similar coal-made glass.

Next to Pennsylvania in the production of pig and rolled iron, and the larger iron manufactures, comes the Erie lakeside region of Ohio and then the Chicago-Gary lakeside region of Illinois and

Indiana, which are readily accessible to supplies of the Lake Superior ores, and have coal-fields within easy reach to the south. In the south-east the iron industry of the United States has developed rapidly on the coal-field of northern Alabama, which is situated in the midst of large supplies of iron ore suitable for the manufacture especially of foundry iron. This ore lies in limestone valleys which supply abundance of flux. From the combination of these advantages, together with that of cheaper labour than in other iron-working districts of the country, this is the district in which pig and cast iron can probably be produced most cheaply, and hence has grown here with rapid strides the town of Birmingham, with similar associations to those of the Birmingham of older and wider fame. In the same state are Sheffield, Bessemer, Anniston, and other towns engaged in the same industry. Anniston has the most extensive manufacture of cast-iron pipes in the United States. It is this district that might be expected to compete mostly keenly in foreign countries with the iron-producing districts of Great Britain; but it is an important element in the comparison that its centre lies, roughly speaking, about 400 miles by rail from the seaport of New Orleans, about 260 from that of Pensacola, on the Gulf of Mexico. An extensive plant for the carrying out of all kinds of iron and steel industries was erected by the United States Steel Corporation at Duluth, one of the chief shipping points of the Mesabi ores, but it was not successful.

In New England, which in colonial days, along with other parts of the Atlantic coast, supplied pig and bar iron to the mother country, the making of pig-iron is almost extinct, but some of the cities still retain a reputation for their manufacture of iron and steel articles of high quality, such as tools and cutlery. It is in the Atlantic states that most of the imported iron ore (nearly all ore of high quality, from Spain, Algeria, and Cuba) is utilised. The principal steel-working establishments on this coast are at Sparrow Point on Chesapeake Bay, nine miles from Baltimore, and at South Bethlehem on the Lehigh river in Pennsylvania.

Notwithstanding the disadvantages of the United States for carrying on an export trade in iron and iron products (except with Canada, and to a smaller degree with other parts of America), the rapid expansion of the iron industry is easy to understand in view of the great development of the American railway system, then the extensive use of machinery of all kinds, and later the enormous use of structural steel in building skyscrapers. And the fact must not be omitted that the United States carry on a widespread export in certain finished articles containing iron, such as automobiles, agricultural implements, sewing machines, typewriters, steel bridges, machinery, locomotives, &c. In the manufacture of all these articles the iron and steel manufactures have the advantage from one cause

or another of an enormous home market, favouring production on a large scale and by the most economic methods. In shipbuilding, in which the Americans have not the same advantage, the fortunes of industry have varied. In 1900 only one steel steamship was built in the United States for the foreign trade. During the First World War American shipbuilding came to the front, but the tonnage built in 1920, 2.7m. tons, showed a great decline on the figures of 1919 (4.7m. tons), while the output of British yards increased from 1.9m. tons in 1919 to 2.1m. tons in 1920. After 1920 there was a rapid decline. In the year ending June 30, 1925, only 125,000 tons were built; in the year ending December 21, 1930, 232,000 tons. With the coming of the Second World War there was an enormous rise in shipbuilding, especially of standard type welded ships, and a considerable proportion of the building took place for strategic reasons on the west coast.

The precious metals of the United States are chiefly produced among the mountains in the west; gold principally on the Californian side of the Sierra Nevada and in many of the Rocky Mountain States as well as in the Black Hills of South Dakota. The mining of gold has fluctuated but is of continuing importance. Silver is principally from the Rocky Mountains, in Utah, Colorado, Montana, and Nevada. For quicksilver see p. 276, and aluminium, p. 290.

Copper is produced largely in the peninsula of Keeweenaw, which juts north-eastwards into Lake Superior (Michigan), in the south-east of Arizona, and in Montana. In this last state the copper ore is almost entirely obtained from the small district containing the mining and smelting towns of Butte and Anaconda, where metallic copper of exceptional purity is produced by the electrolytic process, which yields at the same time considerable quantities of silver as well as gold. The chief lead-producing centre of the United States is now amongst the Ozark Mountains in Missouri. Lead is also mined in the Rocky Mountains (in Idaho, Montana, Utah, and Colorado). Among other important economic minerals of the United States may be mentioned the phosphate rock of South Carolina, Florida, and Tennessee, which forms a valuable manure. Natural gas occurs not only in the part of western Pennsylvania already referred to, but also in many other places; the areas of most abundant production being in Texas, California, Oklahoma, and Louisiana. As early as 1901 there were 21,848 miles of pipe for the supply of natural gas in the United States, and the quantity produced was estimated to be equivalent in the production of heat units to 8½m. tons of coal. The production of petroleum is considered elsewhere (pp. 266-7).

There is only one metal of importance in which the United States are almost entirely deficient, and that is tin. Hence the large import of tin and tin ores, and formerly of tin-plate; the latter being

a much-needed commodity in consequence of the large employment of 'tins' or 'cans' for American products of agriculture. The heavy import duties on tin-plate first imposed by the McKinley tariff in 1890, aided by the increasing facilities for the production of iron, succeeded in establishing a great tin-plate industry in the United States. The production of tin-plate in the country increased from next to nothing in 1891 to upwards of 399,000 tons in 1901. Meanwhile, the import of this commodity, almost entirely from the United Kingdom, sank from about 325,000 tons to less than 53,000, and on the average of the three years before the First World War was less than 33,000. This is another example of the replacement of a former import by the home-produced article. Building stones, lime, cement, and other building materials are too widely distributed to be particularised, but a few special building stones such as the oolitic limestones of southern Indiana have a nation-wide or even international reputation.

With regard to the manufacturing industries of the United States in general, it is noteworthy, in the first place, that they were to a very large extent carried on with the aid of direct water-power. Later coal became more important and still remains the chief source of power, but hydro-electric power has now become very extensively used. The total amount of water-power theoretically available in the United States has been estimated at upwards of 54m. horse power on an average throughout the year, and of which 20m. horse power have been utilised. Among the manufacturing towns which have benefited by the presence of water-power (in some cases called into existence by its presence when that power was used direct for the operation of mills) may be mentioned Lowell, Fall River, and Waltham, in Massachusetts; Nashua, in New Hampshire; Paterson, in New Jersey; Dayton and Akron, in Ohio; and Troy, in New York; the last being one of a group of manufacturing towns (including West Troy, Lansingburg, and Cohoes) which have grown up round the falls that interrupt the navigation of the Hudson. In flour-milling water-power has been used to a very large extent. The Falls of St. Anthony, on the Mississippi river, were the chief means of making Minneapolis (Minnesota) one of the largest wheat markets and probably the greatest flour-grinding centre in the world, though the industry has now grown far beyond the capacity of the falls as a source of power. Numerous flour-mills were driven by the Falls of the Genesee at Rochester (New York), by the Spokane Falls in the state of Washington, and the Falls of the Willamette above Oregon City, in Oregon. Now water-power is utilised essentially indirectly for the creation of electric energy. This power can be transmitted economically up to 300 or 350 miles from the centre of generation—hence the wide influence of the great Niagara works.

The association of water-power development with the creation and improvement of waterways has been mentioned elsewhere. Here may be mentioned an early instance of this kind on the Upper Mississippi at Keokuk, at the mouth of the Des Moines River, about midway between Chicago and Kansas City, where a dam was built across the river on a bed of smooth hard limestone. Above the dam a deep pool upwards of 40 miles in length and more than a mile wide is thus formed. For navigation a single lock available for vessels of much larger size than those formerly plying on this part of the river replaced the former canal of $11\frac{1}{2}$ miles in length passing round the rapids above Keokuk. At the same time the dam allowed of the development of 300,000 horse power in a region embracing a population of over 300,000, within a radius of 200 miles. Much of the power is transmitted to St. Louis, 137 miles away.

The same general principles have been followed in the great modern developments. Thus the works in the Tennessee Valley under the Tennessee Valley Authority aim both at the improvement of the navigation of the Tennessee river (despite doubts as to the economic expediency of such work) and the provision of power. The great schemes such as Boulder Dam in the more arid west are primarily for irrigation, secondly for power. Reference must also be made to the greatest of all such schemes—that of the Columbia river with the Grand Coulee Dam (1941).

Reference has already been made to the fact that few great American towns have grown up on coal-fields (see p. 287). Most American towns have owed their origin to commercial advantages, and a very large number of them to those arising from their situation on waterways. This is applicable even to those which have developed as manufacturing towns through the utilisation of water-power, for this advantage coincides in a great many instances with a situation at the head of river navigation. In the table on pp. 770-1, which includes all the towns in the United States having at the census of 1950 a population of at least 175,000, and certain of the older though now smaller towns of New England, the column giving the chief manufacturing industry must not be understood as indicating the basis of the town's prosperity. In many of them the chief industry is the work of distribution.

Chicago (Illinois), the largest inland town, is the lake-port for the maize-growing and hog-rearing region to the south-west (the famous Corn Belt), but is still more important as lying at the corner of Lake Michigan and a terminal point for all the railways serving the wheat-growing and cattle- and sheep-rearing region of the west and a terminal point for the steamer lines of the Great Lakes. Both circumstances have combined to make the town a great centre of attraction for railway traffic in other directions. It is significant that the site of Gary (Ind.), the iron and steel manufacturing town

of the United States Steel Corporation, was selected at the extreme south of the same lake, the first point touched in coming from the east or south-east.

St. Louis (Missouri), situated a short distance below the confluence of the Missouri and the Mississippi, and till the last decade

Town.	Population in Thousands.					Chief Manufacturing Industry.
	1880.	1900.	1920.	1930.	1950.	
Boston, Mass. .	360	560	750	781	791	Clothing; sugar
Lowell, Mass. .	60	95	110	100	—	Cottons
Worcester, Mass.	60	120	180	195	202	Iron wares; boots and
Fall River, Mass.	50	125	120	115	112	Cottons [shoes]
Lynn, Mass. .	40	70	100	102	—	Boots and shoes
Springfield, Mass.	—	60	130	150	163	Meat packing; iron
						[wares]
Providence, R.I.	105	180	240	253	248	Worsted; rubber goods
Hartford, Conn. .	40	80	140	164	177	Iron wares; small arms
New Haven, Conn.	65	110	160	163	163	Hardware
New York, N.Y.	1,200	3,440	5,600	6,930	7,835	Clothing; various
Jersey City, N.J. ¹	120	200	300	317	300	Sugar; tobacco
Newark, N.J. ¹ .	140	250	415	442	438	Leather
Paterson, N.J. ¹ .	50	105	135	139	139	Silk
Albany, N.Y. .	90	95	115	127	134	Metal wares; textiles
Syracuse, N.Y. .	50	110	170	209	220	Clothing [steel]
Buffalo, N.Y. .	155	350	510	573	577	Meat packing; iron and
Rochester, N.Y.	90	160	300	328	331	Clothing, boots & shoes
Philadelphia, Pa.	850	1,300	1,800	1,951	2,065	Various
Reading, Pa. .	45	80	110	111	109	Steel
Scranton, Pa. .	45	102	140	143	125	Silks
Pittsburgh, Pa. .	240	450	590	670	674	Steel; glass
Akron, O. .	—	45	210	255	273	Rubber tyres
Cleveland, O. .	160	380	800	900	906	Iron and steel
Toledo, O. .	50	130	240	291	301	Foundry work
Columbus, O. .	50	125	240	291	375	Foundry work
Dayton, O. .	40	85	150	201	243	Cash registers
Cincinnati, O. .	255	325	400	451	501	Electrical; chemicals
Youngtown, O. .	—	—	—	170	168	Iron and steel
Louisville, Ky. .	125	205	245	308	367	Tobacco
Detroit, Mich. .	115	285	1,000	1,569	1,839	Motor cars
Grand Rapids, Mich. .	32	90	140	169	176	Saw-milling; furniture
Flint, Mich. .	—	—	—	156	163	—
Indianapolis, Ind.	75	170	315	364	425	Meat packing
Chicago, Ill. .	500	1,700	2,700	3,376	3,606	Meat packing
Milwaukee, Wis.	115	285	460	578	633	Malt liquors
Minneapolis, Minn. .	47	205	380	464	517	Flour milling
St. Paul, Minn. .	41	165	235	272	309	Fur goods; publishing

¹ All these towns are in the immediate neighbourhood of New York Harbour. New York now includes Brooklyn on Long Island.

Town.	Population in Thousands.					Chief Manufacturing Industry.
	1880.	1900.	1920.	1930.	1950.	
St. Louis, Mo. .	350	575	770	822	853	Tobacco; malt liquors
Kansas City, Mo.	55	165	325	400	453	Food processing
Omaha, Neb. .	30	105	190	214	247	Brewing; distilling
Baltimore, Md. .	330	510	735	805	940	Canning; clothing
Washington, D.C.	180	280	440	487	798	—
Richmond, Va. .	65	85	170	183	230	Tobacco
Atlanta, Ga. .	37	90	200	270	327	Cottons
New Orleans, Louisiana .	215	290	390	459	567	Sugar
Birmingham, Ala.	—	40	180	260	299	Iron and steel
Memphis, Tenn..	35	100	160	253	394	Cotton-seed products
Nashville, Tenn..	—	—	—	154	173	—
San Antonio, Tex.	—	55	160	232	407	Trade centre
Dallas, Tex. .	—	45	160	260	434	Various
Houston, Tex. .	—	—	—	292	594	Various
Fort Worth, Tex.	—	—	—	164	277	Various
Denver, Col. .	37	140	260	288	413	—
Seattle, Wash. .	—	80	315	366	462	Flour milling
Portland, Or. .	—	90	260	302	371	Wood
San Francisco, Cal. .	235	345	510	634	761	Sugar
Oakland, Cal. .	—	70	215	284	381	—
Los Angeles, Cal.	—	100	580	1,238	1,958	Fruit packing; motion [pictures]
Oklahoma City, Ok. .	—	—	—	185	242	—
San Diego, Cal. .					321	
Miami, Flo. .					247	Resort
Long Beach, Cal.					244	Resort
Jacksonville, Flo.					203	
Norfolk, Va. .					188	Port
Salt Lake City, Utah. .					182	
Tulsa, Okla. .					181	Oil
Des Moines, Iowa					177	Food processing

The above table includes all towns with more than 175,000 people in 1950 and also a number of others to show diminishing relative importance of some eastern centres.

of the nineteenth century at the lowest place at which the latter river was crossed by a bridge, has long been the chief town on one of the great western high-roads. The twin cities of Minneapolis and St. Paul grew up later after wheat-growing became widespread in the north-west. The mills of Minneapolis have already been noticed. St. Paul arose as the head of continuous navigation on the Mississippi. Cincinnati (Ohio), situated at the north of the great northerly bend of the Ohio River, was the first of the great pork-packing towns. Favoured by excellent water communications, both above

and below, as well as by railways, its general business and importance have continued to grow. Other great railway centres are Indianapolis (Indiana); Milwaukee (Wisconsin), the second in importance of the ports on Lake Michigan and the former focus of German immigration, now famed for its beer; Omaha (Nebraska), on the Missouri, a little above the confluence of the Platte or Nebraska River, at the crossing place of the great line of railway from New York to San Francisco; and Kansas City (Missouri) at the confluence of the Kansas River with the Missouri.

As may be seen from the table opposite, the towns most rapidly increasing in population in the United States are situated principally in the west, and chiefly engaged in handling western products. The case of Chicago has long been known. Founded in 1833 it contained only a few huts. The site of Omaha was first marked out for settlement in 1854. Duluth in Minnesota, the Lake Superior terminus of the Northern Pacific Railroad, had in 1875 a population of 2,500. Being the lake-port for the United States portion of the Red River valley, its receipts of wheat are in excess of those of Chicago. It is likewise a place of shipment for much of the iron ores of north-eastern Minnesota. Remark may also be made on the rapid growth of Detroit, Akron, and Dayton, whose leading industries may be taken as illustrations of the more or less arbitrary selection of particular sites for manufactures of a certain type spoken of on p. 110. It may be mentioned, however, that the leading Detroit industry (automobiles) came as a natural successor to the manufacture of wooden vehicles favoured by the abundant supplies of hardwood timber and the favourable situation for distribution. It scarcely needs to be pointed out that the rubber tyre industry of Akron developed hand in hand with Detroit's automobile manufacture.

Over much of the United States climatic conditions are severe and there has been a marked tendency for people to retire or to spend long vacations in the most favoured states, notably Florida and California. This accounts for the phenomenal population increase in size of such towns as Miami (247,000), Long Beach (244,000), San Diego (321,000) and Pasadena (104,000).

At the close of the nineteenth century the following were the ten leading **seaports** in order of importance as determined by the amount of tonnage entered and cleared in the foreign trade: New York, Boston, Philadelphia, New Orleans, Baltimore, Puget Sound, San Francisco, Galveston, Newport News, and Mobile. In respect of the amount of its foreign commerce New York is without a rival. At the time mentioned the tonnage entered from foreign countries at that port was 48 per cent. of the whole; that cleared for foreign countries rather more than 46 per cent. Although the opening of the Panama Canal in 1914 led to a great growth in the trade of the

Pacific ports, New York is still without a rival. Measured in terms of the total foreign trade the leading ports in 1931-35 were New York, New Orleans, Galveston, San Francisco, Philadelphia, Boston, Seattle, Los Angeles. In 1949-50 the same ten ports held the lead, though in slightly different order, and Galveston-Houston considered as one. New York still held over 40 per cent. of the trade.

The physical conditions present great difficulties in the way of providing commodious harbours at all the ports on the Gulf of Mexico. The hinterland of New Orleans is one of the largest in the country, and has been made much more valuable by the development of railways by means of which the great bulk of the traffic is now carried on. At this port the difficulties were admirably surmounted. A channel of 36 feet in depth is maintained as high as New Orleans (and, indeed, as high as Baton Rouge, 25 miles up) from the south-west Pass. Five canals with a minimum depth of 5 feet connect it in different directions with the neighbouring lakes and bayous. There are huge grain elevators and cotton warehouses and the city is the largest market in the United States for gunny cloth, rice, bananas, cotton, and molasses, and has a great sugar-refining industry. The structure of the Appalachian system has facilitated the construction of railways connecting it with New York, but a much more important connection is established by the Central Illinois Railroad with Chicago, 912 miles distant, nearly due north. By this line there is a large trade from New Orleans in bananas and other imported fruit, as well as in garden produce grown in the neighbourhood of New Orleans in the early months of the year (from January onwards), and from July onwards the same kind of produce is carried the other way—from the northern states to New Orleans. Galveston, on a sandspit, has with difficulty been provided with a navigable channel across the bar. Having the advantage of being only 2,130 miles from San Francisco, as against 2,480 miles, the distance between that port and New Orleans, it became the principal Gulf port of the great railway system of the Southern Pacific Railroad. Later Houston on the shores of the neighbouring lagoon was made accessible and the two really form a twin outlet for Texan oil and other products. Before the opening of the Panama Canal large quantities of Hawaiian sugar were conveyed from San Francisco to Galveston even for New York and other eastern seaports.

Among the minor seaports of the United States may be mentioned Newport (Rhode Island), Washington (D.C.), Richmond (Virginia), a great tobacco port, Wilmington (North Carolina), Pensacola (Florida), chiefly a timber port, Portland (Oregon), a great wheat port of rising importance; Tacoma (Washington), on Puget Sound, one of the termini of the Northern Pacific Railroad. Pensacola has one of the best harbours on the Gulf. Tampa, on

the west coast of Florida, is a great seat of cigar factories and a place of export of rock phosphate. Key West on a small island at the southern end of Florida, forms the southernmost of a chain of keys 140 miles long. In January 1912 a remarkable railway was completed connecting Key West with the mainland and making it the starting-point of a train-ferry to Havana. Later the viaducts constructed for the railway were used for a fine motor road which has succeeded it.

The shipping at American seaports was formerly mainly under foreign flags, the United States flag being represented on the average of the five years 1881-85 by barely 20 per cent. of the whole. By far the largest share belonged to the British flag; those of Germany, Norway, and Italy then coming next after that of the United States itself. Formerly the chief reason of this inferiority of the native flag in foreign commerce was the fact that no vessel was allowed to be registered as belonging to a United States owner unless built in the United States. This disability was removed by an Act of Congress in August 1914, but the higher wages of American crews remained an obstacle to competition with other countries in the carrying trade to and from foreign countries. After 1860, not only did the proportion of the merchant shipping of the United States to that of the United Kingdom decline, but merchant shipping declined absolutely. This was a natural consequence of the two changes which began to be rapid about that date—from wood to iron (afterwards steel) in shipbuilding, and from sail to steam. The first change deprived the United States of its special advantage in shipbuilding material, the second caused the cost of the service of the shipping to be much greater than before, relatively to the cost of ship-production, and so to make the highly paid American labour a hindrance in competition for the carrying trade. The percentage of the imports and exports of the United States carried in vessels registered in the country amounted in the year ending June 30, 1860, to 66·5; in 1870 to 35·6; in 1880 to 17·4; in 1900 to 9·3; and in 1914 to 9·7. In consequence of the great development of shipbuilding during the First World War already noted, the percentage of imports and exports carried in American ships rose in the year ending June 30, 1918, to 21·9; and in that ending December 31, 1919, to 36·4 per cent. These figures include the shipping of the Great Lakes. The figure later dropped but was roughly one-third in the inter-war years. The total amount of shipping engaged in the foreign trade flying the American flag reached in the year ending June 30, 1914, less than 1·1m. gross tons; in 1919, 6·67m.; in 1925, 8·15m.; in 1930, 6·30m. By 1935 this figure had dropped to 4·59, but this excludes the 10m. tons engaging in coastal trade and fishing. There was again a big rise during the Second World War. In 1951 the United States merchant marine, including ships of the

reserve fleet, numbered 4,909 steamships and motorships of 27½m. gross tons—nearly a third of the world total (cf. p. 99).

UNITED STATES : IMPORTS

—	Percentages of Total Value.				
	1924.	1926-30.	1931-35.	1936-40.	1950.
<i>Foodstuffs</i>	24.0	20.8	19.0	12.7	29.0
Coffee	6.9	7.0	8.4	2.6	12.0
Cane sugar	10.1	5.1	6.8	2.6	4.2
Nuts and fruit	2.0	2.1	2.9	1.1	1.9
<i>Raw materials</i>	44.5	34.1	18.6	15.4	27.0
Silk (raw)	9.3	9.2	6.9	2.1	0.2
Rubber (crude)	4.8	7.1	3.6	3.9	5.0
Wood pulp	—	2.2	3.5	1.5	2.6
Tin	—	2.2	2.5	1.6	2.2
Hides and skins (raw)	2.1	2.9	2.1	1.0	1.3
Furs, and manufactures of	2.2	2.8	2.0	1.3	1.2
Woods, and manufrs. of	3.1	2.4	1.9	0.8	4.0
Copper (unmanufactured)	—	2.7	1.7	0.9	2.7
Petroleum	2.0	3.3	1.7	0.9	6.5
<i>Manufactures</i>	21.5	37.8	27.0	18.5	39.8
Printing paper	2.8	3.4	5.1	2.2	5.2
Jute, and manufactures of	—	2.3	2.0	0.9	1.4
<i>Gold and silver, specie and unmanufactured</i>	9.8	7.3	35.2	52.5	3.0
Total value in 1,000 million \$ ¹	4.0	4.3	2.6	5.2	9.1
<i>Countries:</i>				2	2
Canada	11.1	11.7	11.3	14.5	22.1
Japan	9.4	9.4	8.7	6.6	2.1
United Kingdom	10.2	8.0	6.9	6.7	3.8
Brazil	5.0	4.9	5.5	4.3	8.1
Philippines	2.7	2.9	5.3	4.1	2.7
Germany	3.9	5.3	5.0	2.4	1.2
Malaya	4.1	6.1	4.7	7.6	3.5
Cuba	10.0	5.1	4.5	4.8	4.6
France	4.1	3.8	3.4	2.4	1.5
India ³	2.9	3.4	2.9	3.2	2.9
China	3.3	3.5	2.7	3.1	1.6
Italy	2.1	2.5	2.6	1.6	1.2
Mexico	4.6	3.1	2.3	2.3	3.6
Indonesia ⁴	1.6	2.2	2.2	4.2	1.9
Argentina	2.1	2.3	2.0	3.1	2.3

¹ Par rate of exchange (1924-49) £1 = \$4.866; from September 1949 £1 = \$2.80.

² Figures below are percentages of merchandise imported, i.e., excluding gold and silver.

³ Includes India and Pakistan for years 1936-40; India only in 1950.

⁴ Known as Dutch East Indies till after the Second World War.

Here it may be stated that the inferiority in the shipping of the United States which persisted for so long was part of the explanation of the large excess of exports over imports, which was typical

of the periods before the First World War. The cost of transmarine carriage must be borne to a larger extent by the United States than by foreign countries, and this extra cost is represented by the excess of exports. The position was, of course, completely changed by the First World War which converted the United States from a debtor nation to the chief creditor nation, and this position has remained.

UNITED STATES : EXPORTS

	Percentages of Total Value.				
	1924.	1926-30.	1931-35.	1936-40.	1950.
<i>Foodstuffs</i>	19.8	14.9	10.6	9.1	12.6
Fruits and nuts	2.2	2.6	4.3	2.3	0.9
Wheat and flour	7.3	4.9	2.0	1.7	4.5
Lard and substitutes	—	2.1	1.6	0.6	1.1
<i>Raw materials</i>	45.1	22.5	25.2	18.6	17.4
Cotton (raw)	21.1	16.2	19.0	8.7	9.5
Petroleum (refined)	8.7	10.0	9.0	10.6	4.6
Tobacco (raw)	3.6	3.1	5.2	3.4	2.3
Wood, and manufrs. of	3.2	3.2	2.8	1.9	0.7
Coal	2.5	2.5	2.4	2.1	2.6
Copper	3.4	3.0	1.7	2.7	0.8
<i>Manufactures</i>	31.3	54.9	47.6	69.9	63.7
Iron and steel	10.4	5.1	4.4	8.3	4.4
Cars and parts	5.2	8.5	7.1	8.4	6.7
Electric machy. & appar.	1.9	2.2	3.1	3.3	4.0
Agricultural machy. and apparatus	—	2.4	1.2	2.1	1.0
Other machy. & apparatus	—	6.1	6.0	14.3	18.1
Cotton goods	3.0	2.6	2.3	1.9	2.4
<i>Gold and silver, specie and unmanufactured</i>	3.7	5.9	15.0	0.8	5.0
Total value in 1,000 million \$ ¹	4.7	5.1	2.4	3.2	10.8
<i>Countries:</i>					
United Kingdom	21.4	17.6	18.5	18.7	5.0
Canada	13.6	17.1	14.5	15.9	19.4
Japan	5.5	5.1	8.4	7.4	4.1
Germany	9.6	8.3	6.5	2.4	4.3
France	6.1	5.2	5.9	5.4	3.2
Italy	4.1	3.0	3.0	1.9	3.3
China	2.4	2.3	3.1	1.6	0.4
Netherlands	3.3	2.8	2.6	2.3	2.2
Belgium	2.5	2.2	2.5	2.0	2.6
Mexico	2.9	2.6	2.4	2.7	5.0
Philippines	1.3	1.6	2.4	2.6	2.3
Argentina	2.6	3.5	2.1	2.6	1.4
Cuba	4.4	2.8	2.0	2.5	4.4
Australia	2.7	2.9	1.8	2.1	1.4

¹ Par rate of exchange (1924-49) £1 = \$4.866; from September 1949, £1 = \$2.80.

² Figures below are percentages of merchandise exported, i.e., excluding gold and silver.

The United States possesses the **outlying territories** of Alaska, the Hawaiian Archipelago, Puerto Rico, the Panama Canal zone, some of the Virgin Islands, and the small Pacific Islands of Guam and Tutuila, the latter in the Samoan group. Puerto Rico¹ was acquired from Spain after the Spanish-American War in 1898, and in the same year the Hawaiian Archipelago was acquired. The greater number of the Virgin Islands were purchased from Denmark in 1917.

Alaska lies to the north-west of Canada and was purchased from Russia in 1867. It has an area of 571,000 square miles (more than six times that of Great Britain), with a population of 129,000, and is traversed by a magnificent river, the Yukon. It produces commercially furs, salmon, timber, and minerals. Gold deposits occur at Nome on the north side of Norton Sound nearly opposite the mouth of the Yukon, on Douglas Island (the Treadwell Mine), opposite Juneau in 58° 15' N. (where quartz-mining was long carried on and which at one time before flooding stopped working was the largest gold-mine in the world), and elsewhere. Copper is a leading mineral product. Coal is known to exist on several of the islands fringing the mainland to the south of the fifty-eighth parallel of latitude, but is little worked. Alaska has a large potential output of pulp-wood, and recent developments in the rearing of fur-bearing animals (blue fox, reindeer, and seals) should be noted.

MEXICO

South of the United States is Latin America, containing twenty countries in which the dominant influence is Spanish, Portuguese, or that of some other European people, but in which the masses of the people except in the temperate south of South America are partially or wholly American Indian in blood.

The first of these is Mexico, a land more than eight times as large as Great Britain, nearly three times the area of Texas, tapering southwards from the boundary of the United States into the tropics, and then expanding again where it embraces the peninsula of Yucatan. It is nearly 2,000 miles long, its frontier with the United States extends for over 1,500 miles, and there are 6,000 miles of coastline.

The population of 25½m. (1950) is only about 10 per cent. of European origin and 30 per cent. of pure Indian origin, the balance of 60 per cent. being mestizo (mixed Indian and European). The government is nominally like that of the United States. In form it is a federal republic with a constitution providing for universal manhood suffrage, but probably 65 per cent. of the population are illiterate, and Mexico has developed only under strong dictators.

¹ Technically described as a "Commonwealth associated with the United States."

Of the total area of 760,000 square miles it is estimated that 51 per cent. is covered by pastures and only 5 per cent. by arable land, with forests accounting for 33 per cent., potentially useful land for 5 per cent., and waste land for 6 per cent. Landed property developed in Spanish colonial days under a system of large feudal estates, *haciendas*, and many of these still survive; but more common to-day are the *ejidos* (communal farms or villages) for which 65m. acres of land (over 100,000 square miles) had been expropriated up to 1945 and distributed among more than 2m. families. Rather less than half the land workers are settled on these *ejidos*.

The several regions of which the country is made up are for the most part separated by mountain barriers and it is mainly the pre-eminent importance of one of the regions, the Central Plateau, which has caused the whole to form one political unit for hundreds of years, a unit physically separated from the United States by an area of desert or semi-desert, in the eastern part of which the Rio Grande forms a convenient line of demarcation.

Regional survey. The Central Plateau, the favoured highland area about Mexico City, though only about one-sixth of the area of Mexico, contains more than half the population, and by far the larger proportion of the white population, mainly Spanish, many of them the descendants of those who, under Cortez, here overthrew the old Aztec Empire in 1519–21. It lies at the height of about 7,000 feet above sea-level, is bordered east and west by rugged mountains, and is made up of a number of basins separated by mountains of volcanic origin, including some cones towering to heights of eternal snow, and containing a few surviving lakes, notably in the great valley of Mexico. Although in the tropics, these basins enjoy a climate more truly temperate than that of most of the temperate zone. There is no hot summer or cold winter, but an average temperature of between 55° and 65° F. for every season of the year. Days are warm and nights cool; the sun is hot at mid-day, and occasionally there are frosty nights. The rainfall, on the average about 30 inches per annum, occurring mostly between April and October, is sufficient for agriculture, though crops suffer in dry seasons. Irrigation is practised where streams fed by the heavier rains and melting snows of the encircling mountains reach the basins.

Maize, the principal crop and staple food, occupies as much land as all other crops together—a greater proportion of the crop land than in any other large country. Other crops conspicuous in the central region are wheat and barley, beans and potatoes, and—as fodder for cattle—alfalfa (lucerne). Much of the pasture land is on the less fertile lower slopes of the mountains, where the soil is apt to be dry, and on these slopes also are grown the agaves, the most distinctive crop of the Central Plateau, drought-resisting plants

native to Mexico, with long, sharp, fleshy leaves, of which the century plant is an example. Most of these are raised for their sap, which is used in the making of *pulque*, a favourite fermented beverage. A distilled beverage, *mescal*, is also made from the root. Part of the crop is used to yield the long, strong maguey fibre to make woven mats and other articles.

Mineral wealth, too, associated partly with the volcanic rocks, has long been important in central Mexico. The silver and gold mines of the Aztecs were the chief attraction for the Spanish conquerors, and Mexico still leads the world in the production of silver, providing more than half the total mined.

Manufactures date back to the bygone civilisation, but the old industries, the making of pottery, textiles, and other articles, have somewhat declined since the rise of factories financed by foreign capital; besides having the advantages of local labour, a local market, and water-power furnished by streams from the Sierra Madre Oriental, these are promoted by import restrictions and prohibitions. Cotton factories using raw material from northern Mexico are the most important. Tobacco factories, flour mills, breweries, plants for the extraction of vegetable oils, and other establishments supplying the domestic market and having the additional advantage of more or less raw material produced locally, are also to be noted. Wartime conditions so stimulated industrial production that by 1947 the output of the leading industries had increased nearly fourfold over that for 1940.

Each basin of the Central Plateau has an important town as its centre, and naturally the most important of all, the city of Mexico, with a population of over 2m., is the centre of the richest of all the basins, the valley of Mexico. This city is not only the political capital but also the financial, commercial, industrial, and cultural centre of the country.

The Northern Plateau is a continuation of the Central Plateau, with similar land-forms and without any marked physical breach, but distinguished by its smaller rainfall and a consequent difference in vegetation and distribution of the population. Without irrigation, crop cultivation is impossible, and cattle-rearing on large ranches is the prevailing economic feature. In the basins, dry bush and grassland furnish the fodder, especially from June to October, when the rainfall is somewhat more plentiful. Here fibre is obtained from several wild plants, chiefly two kinds of ixtle, and this region is also the source of guayule (a type of rubber). The basin known as la Laguna, at the intersection of the International and Central railways, is irrigated by the control of the floodwaters of the Rio Nazas, and in it is grown the major part of the Mexican cotton crop.

Mines are important in the Northern Plateau. The cities are mainly centres of mining areas producing, in addition to silver and

gold, copper, lead, zinc, iron, and coal. These latter industries are modern, the copper production in particular being an extension of the Arizona industry into Mexico.

The state of Sonora, in the north-west of the country, sinks down to low levels, and is, in the main, desert, especially where it approaches the frontier. Farther south, where higher mountains promote greater rainfall, more streams descend to allow of irrigation settlements. A railway running parallel to the east shore of the Gulf of California into the United States, and several small ports along the coast, furnish outlets for the mines on the mountain slopes as well as for the irrigation settlements.

The narrow, mountainous peninsula of Lower California is also desert for the most part, though there are a few patches of irrigated land. There are also a few mines, notably a large copper-mine on the east coast, and a little fishing.

The sierras bordering the plateaus east and west present some marked contrasts. The Sierra Madre Occidental, being on the lee side with reference to the prevailing rain-bearing winds, the trade-winds, has a scantier rainfall than the eastern range, though enough to maintain green pastures below and pine forests above. Its chief wealth is in its mines. It forms a marked barrier, an unbroken wall in which the valleys are mostly narrow gorges without utility as passes.

The Sierra Madre Oriental is less high and continuous, and has several lines of valleys through which run railways to the Gulf ports. The most important of these is the series followed by the railway from Mexico City to Vera Cruz. The way is steep, but the valleys are flat-floored and productive, the products changing in the descent from grain to coffee and tobacco, and still lower to sugar-cane, bananas, and tropical forests. On the middle slopes of the depression leading down to Vera Cruz the temperature is always pleasantly warm, and the rainfall in many places averages 100 inches or more in a year. Here, also, manufactures are carried on. Orizaba is the leading centre of textile factories in Mexico.

At the foot of the Eastern Sierra is a coastal lowland, *tierra caliente*, hot country. Most of it is unimportant at present, but in it are three places or districts of outstanding importance: the port of Vera Cruz; the petroleum fields near Tampico; and the sisal district of Yucatan.

Vera Cruz is on a desolate shore, and has a poor natural harbour, but it is the terminus of the route from the Central Plateau, and has been converted into a good port, with modern equipment.

Indications of petroleum have been found in many parts of Mexico, but nearly all the production has been in the state of Vera Cruz, west and south of Tampico. Most of the petroleum is heavy and has an asphaltic base. The product of the oil-fields on the

northern coast of the Isthmus of Tehuantepec, the narrow waist of Mexico, is light and has a paraffin base, but the amount is small compared with the total production. The wells of the Vera Cruz districts in general are not exceptionally deep and a fairly large proportion of them have been successful. They include some of the largest and most sustained gushers known, but the production of the whole has dropped greatly since 1921—from the peak of 195m. barrels in that year to 74m. barrels in 1950. Efforts to increase the output again have met with considerable success; the figure quoted for 1950 was the highest since 1926. The industry developed in foreign hands, mainly American and British, but in 1938 the oil-fields were expropriated by the State, with the exception of a single concession which was bought out in 1950. Most of the oil is refined within the country, one refinery in the vicinity of Mexico City being supplied by pipeline from the wells. Tampico, the chief town and port of the oil-fields, has been improved so as to allow modern tankers and freighters to berth along the waterfront. A coastal lagoon with connecting canals provides a sheltered shallow waterway 85 miles southwards to Tuxpam, another oil port, where a submarine pipeline conveys oil to tankers lying about a mile off-shore.

The other important lowland area is in the northern part of the Yucatan Peninsula. The rainfall here is scanty and the dryness is accentuated by surface conditions. The soil is underlain by a highly soluble limestone, in which sink holes are numerous, and there is no surface drainage. Maize and other supply crops can be raised, and in prehistoric times the Maya Indian civilisation flourished here. Modern commerce and foreign capital have brought a new prosperity to the district. Nowhere else in the western world can sisal be grown under conditions at once so favourable to production and so accessible to the United States market. Henequen, as the fibre is here called, is grown on about a third of a million acres yielding a crop of over 100,000 tons, much of which is made locally into rope and twine. Railways radiating from the inland centre of Merida, supplemented by tramways running through the large plantations, convey the product to the north Yucatan port of Progreso, where a new pier $1\frac{1}{4}$ miles long, ending in a large wharf, provides berthing for vessels of moderate draught. The southern part of the peninsula is the chief source of chicle, the basis of American chewing-gum, obtained by tapping the zapote tree (*Achras Sapote*, Linn.).

The narrow lowlands on the Pacific coast east and west of the Isthmus of Tehuantepec are similar to those on the Atlantic side, moist in some places, and dry in others, wooded, slightly developed. The isthmus itself is a low, hilly area.

Southern Mexico has, for the most part, a population out of the reach of railways. More people live in the highlands than in

the lowlands. The Sierra del Sur is a highland region separated from the Central Plateau by the great gorge of the Rio Balsas. Round the head of the Balsas Valley a ridge allows of a railway from the plateau entering the sierra, but the region is so dissected that communities within it, mostly of Indians, are isolated from each other and contribute little or nothing to world trade. Indian languages and ways of living still persist.

The highlands of Chiapas, running into Guatemala, are less dissected. There is a rather dry highland valley in which grain crops are raised and cattle and sheep pastured, and there are moist slopes below on which coffee is grown for export. The people are largely Indian and primitive in their mode of life. There is more trade with Guatemala than with other parts of Mexico, and the region may be considered the northernmost of the Central American highlands.

Production and trade. To sum up, the following table shows the principal crop returns for Mexico as a whole in 1950, with 1951 production figures in brackets.

Crop	Acres	Metric Tons
Maize	9,563,000	3,122,000 (3,400,000)
Wheat	1,310,000	587,000 (590,000)
Barley	495,000	162,000 (164,000)
Dry Beans	2,190,000	250,000 (240,000)
Cotton	1,357,000	259,000 (298,000) (ginned cotton)
Sugar (Raw)	500,000	705,000 (732,000)
Coffee	358,000	66,000 (71,000)
Rice (Paddy)	267,000	187,000 (180,000)
Bananas	60,000	257,000 (187,000)
Alfalfa	—	2,125,000

Methods of cultivation are often crude, and though the crop of maize is so big the yield averages only about 10 bushels per acre—a third of what it is in the United States. The future of Mexico's agricultural development lies largely in the extension of irrigation works. A great deal has been and is being done in this direction, but much more irrigated land is needed before Mexico can become self-supporting in the matter of food. On the other hand there is a surplus of other than subsistence crops, and these 'cash crops' figure largely in the foreign trade. About half the production of ginned cotton—a record amount in 1950, with a further increase in 1951—is exported; and in 1950 cotton provided over one-sixth of the value of all exports. In recent years there has been also a substantial surplus of sugar for export (150,000 tons in 1949), and

among other export crops are coffee and bananas. The importance of henequen (sisal) in Yucatan has been noted in the regional survey.

Livestock run to big numbers—14½m. cattle, 12m. sheep and goats, 6½m. horses, mules, and donkeys, 6m. pigs. They tend to be concentrated in the central states, and the livestock industry could well be expanded, possibly at the expense of some of the less productive maize land; but a discouraging factor has been widespread foot and mouth disease.

Summary particulars of the producing oil-fields, which are practically limited to the state of Vera Cruz, have been given in the regional survey. Mines are mostly foreign-owned. The output of silver, though the biggest factor in world production, declined by nearly half during and after the Second World War, and was under 50m. fine ounces in 1950. Mexican production of gold in that year was 408,000 fine ounces, and of copper over 60,000 tons. Lead and zinc each increased in annual output after the war to about a quarter of a million tons; in 1950 Mexico was second only to the United States as a source of lead supply, and third in the list of countries supplying zinc. To a large extent both lead and zinc are refined locally before being exported. The metal content of the iron ore produced in 1950 amounted to 286,000 tons, and there are very large reserves of this ore. Monterrey is the centre of the iron and steel industry. The only important coal-field, near the Rio Grande, does not produce enough for home consumption; the total mined in 1950 was less than a million tons, and bunkers cannot be replenished with coal at Mexican ports, though there is no lack of fuel for oil-burning ships.

Trade is almost entirely with the United States, which, in terms of value, supplies between 80 and 90 per cent. of both imports and exports. Imports are fairly well balanced by exports—imports in 1950, pesos 4,403m. (£182m.); exports, pesos 4,338m. (£179m.). Machinery and motor vehicles and parts formed nearly a fifth of the imports, and it is evidence of Mexico's insufficiency of home-produced food that wheat accounted for 6 per cent. of the total. Exports are made up chiefly of a few staple commodities produced in large quantities in special districts. In 1950, lead, zinc, and copper contributed 22 per cent. by value, silver 6 per cent., and oil 6 per cent., these together making up a third of the total. Cotton (over 17 per cent.), coffee (over 5 per cent.), and sisal (3 per cent.) made up another quarter; while fish contributed no less than 9 per cent.

Besides the ports already mentioned, Puerto Mexico, the Atlantic terminus of the Tehuantepec Railway, and Salina Cruz, the Pacific terminus, handle a good deal of traffic, though inevitably much less than before the opening of the Panama Canal. The Pacific coast

generally has better harbours than the Atlantic, but suffers from the lack of tributary areas with convenient means of communication. Acapulco, at the foot of the Sierra del Sur, has the best natural Mexican harbour, but insignificant commerce. Even Manzanillo, the only Pacific port having direct rail connection with the Central Plateau, draws very little except local trade. Mazatlan, formerly the chief port of the Pacific coast, has lost most of its sea-borne trade, being no longer a regular port of call for any shipping line, and visited by tramp steamers only when cargo is offered.

POPULATION OF PRINCIPAL TOWNS (1950)

Mexico City 2,113,000			
Monterrey 340,000		Torreón 132,000	
Guadalajara 337,000		Ciudad Juárez 129,000	
Puebla 230,000		Vera Cruz 123,000	
San Luis Potosí 156,000		Matamoros 118,000	
Merida 156,000		Aguascalientes 117,000	
Culiacán 145,000		Toluca 115,000	
Mexicali 141,000		Chihuahua 111,000	
Leon 140,000		Morelia 104,000	

THE WEST INDIES

These islands form an archipelago over 1,600 miles long, curving south-eastwards from near the coast of Florida to the shores of Venezuela. Enclosing the Caribbean Sea, they lie across the trade routes to the Gulf of Mexico and the Panama Canal. Together they have an area slightly larger than that of Great Britain and support a population of nearly 17m.

The four largest islands—Cuba, Jamaica, Hispaniola, and Puerto Rico—form the Greater Antilles and lie in the west of the group; they account for nine-tenths of the total area and only a slightly smaller fraction of the population. The very numerous small islands to the east and south form the Lesser Antilles, while to the north are the Bahamas, a group which is not properly within the West Indies but is so close that it is convenient to consider it at the same time.

The Bahamas are coral islands, as are some of the outer islands (Anguilla, Barbuda, Antigua, and Barbados) of the Lesser Antilles. All the other islands are mountainous, and the higher parts of the surface generally are covered with dense forests. The Lesser Antilles are, in most cases, the peaks of a largely submerged line of mountains; many of them are of volcanic origin.

The population is almost entirely descended from natives of other continents, the aboriginal Caribs (themselves the descendants of Mongolian migrants) having been almost exterminated within a

short period of the discovery of the islands by Columbus. A large proportion of the inhabitants are the descendants of African slaves, and these are rapidly increasing their numbers. East Indian and Chinese coolies were introduced as labourers after the liberation of the negroes, because of the unwillingness of the free negroes to work on the plantations, and the descendants of the newcomers likewise remain.

Some of the islands are to-day very densely peopled. Barbados, for instance, has more than 1,200 inhabitants to the square mile, Martinique nearly 700, and Puerto Rico 650. These figures contrast with much lower densities on the largest islands: Cuba 120, Hispaniola 200, Jamaica 310. On the other hand, many of the smallest islands are inhabited either sparsely or not at all, and the lowest density of all these territories, 18, is found in the Bahamas. In spite of much progress achieved during and since the Second World War, the living standards of the majority of the people are low, the demand for labour being to a large extent seasonal. Overcrowding and under-employment remain serious problems.

As primary producers, the islands export sugar and other commodities to Europe and North America, receiving manufactured goods in return. But the economic history of the area has been one of great fluctuations, as the price of sugar has risen and fallen on the world market. Over-production has played its part in the story, and the competition of beet-sugar grown in Great Britain and the United States has been seriously felt. The banana industry has had its own troubles, in the form of widespread disease. Hurricanes also provide a serious setback from time to time, much devastation being caused. Recovery takes perhaps a year in the case of bananas, two years or longer in the case of sugar, and as long as ten years in the case of coconuts. Irregular rainfall is another drawback in many parts, particularly in the north-east, where there is too much rain on the windward side and too little on the leeward.

Many of the islands are dependent upon a single export commodity, so that the effects of failure or of a drop in price are felt severely. The general policy of concentrating on cash crops for export has furthermore tended to discourage the growing of food which is much needed for the rapidly increasing indigenous population. Sugar is pre-eminently a plantation crop, but apart from the large estates a good deal is also grown on small holdings, which are particularly numerous in Trinidad, where they occupy a third of the land under sugar.

The development of close relations between the territories has always been handicapped by the great number of islands involved and by the distances separating them. Lack of easy communication has caused the islands to grow up apart, each developing its own

characteristics and traditions. There is not even a common language. The introduction of air services has done something to break down the barriers of isolation, but has not fundamentally changed the situation. Moreover, shipping problems are aggravated by the fluctuating and varied demands of the traffic: refrigerated ships are required for the conveyance of bananas, tankers for the transport of oil, while passenger traffic is to a large extent seasonal. Navigation, too, is sometimes rendered dangerous by hurricanes in the period from July to October, and especially in September, when the sea is at its warmest and the winds are very variable.

Political divisions. Cuba is an independent republic. Two other republics—Haiti and the Dominican Republic—share the island of Hispaniola. Puerto Rico and some of the Virgin Islands belong to the United States. The remaining islands are colonial territories of Great Britain, France, and the Netherlands, those owing allegiance to Britain being by far the most numerous and important.

Arrangements are well advanced (1953) to link most of the British islands in a federation (see under **BRITISH WEST INDIES**, p. 789).

An interesting experiment of recent years has been the development in the West Indies of a form of regional co-operation known as the Caribbean Commission. The Commission consists of representatives of the four Powers with West Indian dependencies, and acts as consultant and adviser in all matters of economic co-operation and social welfare. It has been responsible for bringing into being a regional assembly known as the West Indian Conference, consisting of delegates from each of the numerous territories. Though with obvious limitations, since they lack executive power, both the Commission and the Conference provide a valuable forum for the exchange of views and play a useful part in the life of the whole Caribbean area. Particulars of the principal units are subjoined.

CUBA is almost as large as all the other islands put together, with an area of 44,164 square miles (nearly nine-tenths the size of England) and a population (mostly white) of $5\frac{1}{2}$ m. It lies just within the tropics and is 760 miles long by 36 to 195 miles across. After its discovery by Columbus it remained under Spanish rule until 1898, thereafter receiving the guardianship of the United States until 1934, when it became politically independent. The island is still dependent economically on the United States, which has large investments, particularly in the sugar industry.

Much of the interior is upland and hilly, but the only important mountain range is that which rises from the south coast in the east, the Sierra Maestra, reaching a height of nearly 8,000 feet. There is a considerable extent of coastal swamp in the south, but much of the northern part of the 2,000-mile coastline is formed by coral reefs, in which the action of small rivers has formed a number of excellent and almost landlocked harbours. About half the land

area is devoted to agriculture and of this one-third is arable and two-thirds pasture. Half the remainder is forested and the rest is made up of waste land and built-on areas.

Cuba is predominantly an agricultural country, having a great deal of good soil, a growing season lasting the whole year, and ample labour. Sugar is the principal crop, and with an annual output of 5m.-6m. tons of raw sugar Cuba is the world's foremost producer and the largest exporter, supplying nearly half of the sugar entering international trade. The cane is grown in fertile areas throughout the island, but especially in the centre and east, where less rainfall is received than in the west. In certain regions in the centre and west sugar gives place to tobacco, Cuba's second staple crop, which forms the basis of a flourishing cigar industry.

Other main products are fruit (chiefly bananas and pineapples) and coffee, most of which is grown in the mountainous districts of the south-east. Extensive plains, or savannas, with natural pasture throughout the year but a poor soil, are characteristic of the east-central part of the island, and here cattle-ranching has been actively developed. The well-forested mountain slopes yield cabinet woods and other forestry products. Mineral deposits are both valuable and varied, but only manganese, chrome, iron, and copper have been seriously exploited.

Commerce generally is greatly stimulated by a reciprocity treaty with the United States, which takes two-thirds of the Cuban exports and supplies four-fifths of the imports.

Havana, the capital, situated on a natural harbour on the north-west coast, is connected with the rest of the island by a well-developed system of railways (4,880 miles) and roads, the latter having as backbone a 700-mile central highway traversing the island from east to west.

CUBAN CITIES WITH AN URBAN DISTRICT POPULATION OF OVER 100,000
(1943 CENSUS)

Havana	673,376	Santa Clara (Las Villas)	122,291
Holguin	171,997	Santiago	120,577
Camaguey	155,827	Sancti Spiritus	104,578
Marianao	135,815		

HAITI. The Republic of Haiti, nearly half as large again as Wales, occupies the western third (10,714 square miles) of Hispaniola. It was a French colony before 1804, when the slaves revolted and founded the world's first negro republic; only a few hundred of the 3m. inhabitants are white. Because of the mountainous terrain only about a sixth of the total area is devoted to agriculture; three-fifths is covered with forests and the balance (rather more than a quarter) is reckoned as waste. Early methods of farming led to some impoverishment of the soil, deforestation,

and erosion; measures to restore productivity are now in hand. Coffee is the principal crop, followed by sisal, bananas, and sugar, grown in the fertile valleys by which the wooded high ground is broken. Mineral deposits are known, but, except for bauxite (mined since 1944) and copper (mined since 1950) remain largely undeveloped. Trade is chiefly with the United States, second place being taken by Belgium. Port-au-Prince (population 196,000) is the capital and only large city.

THE DOMINICAN REPUBLIC, occupying the eastern two-thirds (19,332 square miles) of Hispaniola, was formerly under Spanish rule and has had a separate existence since 1865. Its population numbers 2½m. The interior is mountainous and includes the highest ground (10,500 feet) in the West Indies, but the valleys and coastal plains are fertile. Nearly three-quarters of the whole area is forested, most of the remainder being divided nearly equally between cultivated land and pasture land. The sugar industry, largely owned by foreign corporations, provides more than half the country's exports, which also include cocoa, coffee, tobacco, and maize. Rice, important as a local item of food, is also grown. The forests, largely untouched, yield cabinet woods and dyewoods. As in Haiti, mineral deposits are known to exist but development is on a small scale. The United States and United Kingdom are the principal customers, followed by Canada, while imports are mostly from the United States. Ciudad Trujillo, the capital, has 186,000 inhabitants.

PUERTO RICO, with an area of 3,435 square miles (somewhat smaller than Devon and Cornwall), and a population, mostly of Spanish descent, of 2½m. (double that of Devon and Cornwall), is the smallest and most easterly of the Greater Antilles. Ceded by Spain to the United States in 1898, it was given an increasing measure of self-government, subject to the approval of local legislation by the United States Congress; and even this restriction was abolished in 1952 when Puerto Rico acquired the status of a self-governing 'free commonwealth' in close association with the United States. The mountainous interior rises to over 4,000 feet and is fringed by coastal plains varying up to 12 miles in depth. Rainfall is adequate for successful agriculture in most parts of these plains, but in the south it has been necessary to develop irrigation schemes. Lands devoted to agriculture account for nearly three-quarters of the total and comprise 1,500 square miles classed as arable and nearly 1,000 square miles classed as pasture. A further 350 square miles are forest-covered and the balance of 600 square miles is regarded as waste. Compared with many other West Indian islands Puerto Rico enjoys a high standard of living, based on its agricultural exports, which are taken almost exclusively by the United

become seriously deficient and is maintained in a fertile condition only by the regular application of imported fertilisers. Sugar is grown on the plains and forms the backbone of the economy (more sugar being produced than in all the British, French, and Netherlands West Indies combined), but this supremacy has been gained only since the beginning of the century at the expense of coffee, which is still grown on the hillsides for export. Other products include tobacco, pineapples, oranges, and coconuts. The former forest lands were denuded during the nineteenth century and attention is now being devoted to re-afforestation. The capital, San Juan, on the north coast, had a population of 224,000 at the 1950 census, and to this was added in the following year another 132,000 by merging in the capital the town of Rio Piedras. In the south the chief town is Ponce (127,000).

To the east of Puerto Rico are the fifty small islands and cays forming the **American Virgin Islands**, with an aggregate area of 132 square miles. Half this total is arable and pasture land (mostly the latter), and another third is forested, leaving a sixth which is barren. The islands have little rainfall and are mostly uninhabited, but the three principal islands—St. Thomas, St. Croix, and St. John—support nearly 30,000 inhabitants and produce rum. St. Thomas was once the leading slave market and trading centre of the Antilles. It has a magnificent harbour at Charlotte Amalie (11,500), the capital of the group, which is a free port and still does business in fuelling and servicing ships.

BRITISH WEST INDIES. For purposes of administration the British islands are grouped into six colonies, namely, in geographical sequence from north to south and east: the Bahamas, Jamaica, Leeward Islands, Windward Islands, Barbados, and Trinidad and Tobago. The total area is little more than 12,000 square miles (about the size of Belgium), the total population nearly 3m. The federation of all these islands, apart from the Bahamas, has been agreed (1953) after years of discussion. The project is officially sponsored, but there are many practical difficulties. The islands are scattered, distances are great—Jamaica is 1,000 miles from Barbados—and there is an intense local patriotism in each of the islands. Shipping services with the United Kingdom are limited. Other links with the outside world include steamer and air services with Canada, which provides an important market, but the fact that it is a dollar country and the islands belong to the sterling area has caused some interference in post-war years with traditional trade relations; in particular, Canada begins to turn to countries outside the British Commonwealth for sugar.

The absence of adequate mineral resources in most of the islands—Trinidad, with its supplies of oil, provides a notable exception—weakens their position economically, but the possibilities

of industrialisation have not been overlooked and a number of promising secondary industries have been set up in Jamaica and Trinidad. The climate encourages winter tourist traffic, which is an important industry; there are first-class hotels in the Bahamas, Jamaica, Barbados, and Trinidad. By an arrangement made with Britain during the Second World War, the United States obtained the right to establish six bases for defence in the Bahamas, and others in Jamaica, Antigua (Leewards), St. Lucia (Windwards), and Trinidad.

The Bahamas are a chain of some thirty islands, with many hundreds of uninhabited cays and rocks, extending south-east 700 miles through the Atlantic from near the coast of Florida; lying mainly outside the tropics, they have a less intense climate than the West Indies proper. The total land area is 4,400 square miles—equal to that of Jamaica—and the total population 77,000—five per cent. of Jamaica's. Only one-eightieth (54 square miles) of the aggregate area is cultivated, and apart from 1,120 square miles of forest the rest—about three-quarters of the total—has little or no potential value, the coral soils being porous, dry, and not well suited to agriculture. Where favourable conditions exist locally, tomatoes, sisal hemp, pineapples, bananas, and vegetables are grown. The small export trade is in tomatoes, sisal hemp, crawfish, and salt, most of it being with the United States and Canada. The collection of sponges, formerly the predominant industry, has declined owing to the effects of a fungus disease in the sponge beds. Nassau, the capital, lies on the island of New Providence, where more than half the population lives. Its development as a tourist resort of Americans is the principal factor in the economic life of the islands.

Jamaica is by far the largest of the British West Indies, as well as the most advanced politically, with an area of 4,400 square miles (rather more than half the area of Wales) and a population approaching 1½m. The main axis of the island runs east and west and is traversed by a mountain range culminating in the east in the Blue Mountains, which rise to over 7,000 feet. Indeed, the whole island is mountainous and the trade winds, striking the north and east coasts, cause a very heavy rainfall in those areas, accounting for a great contrast in vegetation and products between that side of the island and the south and west, where rainfall is often inadequate. Occasionally hurricanes bring devastation, that of 1951 having been a serious setback to post-war development. Rather more than a third of the island is devoted to agriculture (660 square miles to cultivation and 930 square miles to pasture); forests cover another 780 square miles and there are 500 square miles of potentially productive land, leaving a balance of over 1,500 square miles for built-on areas and waste.

Bananas, grown on the lower and wetter ground, supplied nearly half the exports before the Second World War; production then fell disastrously through leaf disease, but energetic research work in the development of hardier strains helped to put the industry on its feet again, and despite later hurricane disaster it is now an important runner-up to the main industry of sugar production. Sugar is cultivated in plantations away from the areas of greatest rainfall and is the basis of a thriving output of rum. A third staple product is tobacco leaf, chiefly exported in the form of cigars. Coffee (grown in the Blue Mountains), pimento, cocoa, ginger, oranges, and grapefruit are also exported. As part of a general policy of expanding Jamaica's economy, new developments in bauxite mining and cement manufacture are worthy of note. Most of the island's exports go to the United Kingdom, but Canada and the United States are also recipients.

Kingston, the capital, is on the south coast and with well over 100,000 inhabitants is the only town of considerable size. It is the home of the new University College of the West Indies, incorporated in 1949. The small Turks and Caicos Islands, yielding particularly good salt, and the Cayman Islands, with a turtle fishing industry, are dependencies of Jamaica, lying respectively some hundreds of miles north-east and north-west of the main island.

The Leeward Islands, bounding the Caribbean on the north-east, are a somewhat scattered group of tiny islands divided administratively into four presidencies: Antigua (with Barbuda and Redonda); St. Christopher-Nevis (consisting of St. Christopher—usually called St. Kitts; Nevis, and Anguilla); Montserrat; and the British Virgin Islands. Antigua (108 square miles; three-fourths the size of the Isle of Wight) is the largest of them and the seat of government. Together, all these islands have a land area of 420 square miles and a population of 110,000. Half the total area is waste; of the remainder 65 square miles are cultivated and about the same amount is pasture land, with forests accounting for 40 square miles and potentially productive land 27 square miles (on Nevis). Antigua and St. Kitts are sugar islands and also produce useful quantities of Sea Island cotton, which in the case of Nevis and Montserrat is the principal crop. The sparsely populated British Virgin Islands raise livestock and vegetables which they sell in the nearby American Virgin Islands; in most of them agriculture is hampered by inadequate rainfall.

The Windward Islands extend southwards from the Leeward Islands towards Trinidad. They have much more rain than the Leewards, are mountainous, volcanic, and heavily forested, and are distinguished by their great beauty. They have a combined area of 821 square miles, half of it forested. The main crops occupy one-fourth of the total, and permanent pasture land (confined to St.

Lucia) about one-eighth; the 116 square miles that remain are built-on or waste. Some of the islands were once French possessions, and French culture is still evident. The four major islands of the group are Dominica (with a diminished production of limes), St. Lucia (producing sugar, copra, and cocoa), St. Vincent (arrowroot, Sea Island cotton, and copra), and Grenada (cocoa and nutmegs). Dominica, with 304 square miles, is the largest of them, but St. George's, in Grenada, is the capital. The total population, which includes the last survivors of the original Caribs, is only a quarter of a million.

Barbados is the most easterly of the West Indies and is closely cultivated, the soil being rendered very fertile by an admixture of volcanic dust. It is little larger (166 square miles) than the Isle of Wight, but has over 200,000 inhabitants, making it the most densely populated part of the West Indies. The interior is nowhere mountainous, the land rising to not much more than 1,000 feet, with the result that nearly 80 per cent. of it is devoted to agriculture. The island's economy is dependent almost wholly on sugar and its products—molasses and rum—the yield for so small an area being remarkably high. A great deal of pioneer scientific work has been done in the plantations, and the Central Sugar Cane Breeding Station is located here, doing valuable work in producing varieties with a higher extraction rate. Canada takes half the exports, Britain a third, and between them the two countries supply nearly two-thirds of the imports. The chief town and port, Bridgetown (estimated population 15,000), is on the western or leeward side of the island. Barbadians are almost entirely of negro descent.

Trinidad (1,864 square miles; about the size of Lancashire) and **Tobago** (116 square miles) are the southernmost of the West Indian islands; they support a population of about 700,000, of whom Trinidad has all but some 30,000; about a third of the total are of East Indian descent. The larger island lies opposite the mouths of the Orinoco, and is only a few miles from the coast of Venezuela; a continuation of the mainland coastal range runs through the north of the island. On the west coast, facing the mainland and forming one side of the almost enclosed Gulf of Paria, are the chief port and capital, Port of Spain, and good anchorage generally. The north, east, and south coasts are devoid of harbours and almost unapproachable by shipping, though hurricanes are almost unknown.

More than a third (770 square miles) of Trinidad and Tobago is given over to agriculture and more than a half (1,080 square miles) is forested; most of the balance of 127 square miles is waste. Sugar (from the drier western side of Trinidad) and cocoa (a major industry early in the present century) are the principal agricultural products, but these are far surpassed in value by the island's mineral wealth, which provides nearly 80 per cent. of all the exports. For Trinidad

is one of Britain's foremost oil-producing colonies, with an output of 2½m. tons of crude oil in 1950, and also has the famous 100-acre Pitch Lake, a deposit of natural asphalt used by Drake for caulking his ships in the sixteenth century and now a source of asphalt for macadamised roads. Both the oil wells and the Pitch Lake are in the southern part of the island. Besides producing and refining its own oil, Trinidad refines crude oil imported from Venezuela. Trinidad's principal customers are, in descending order, the United Kingdom, Brazil, Canada, and the United States. Imports are from the United Kingdom, Canada, the United States, and Venezuela. Port of Spain, which has a population of over 100,000, serves as an entrepôt port for the transshipment of goods from South America, Europe, and New York destined for other West Indian islands. Near it is the Imperial College of Tropical Agriculture, founded in 1921 as a training ground for the whole Empire.

Tobago, 21 miles to the north-east, produces sugar, but only about a quarter of the island is devoted to agriculture. It is hilly and rugged, and about half the surface is clothed with forest. Scarborough, the chief town and port, has about 1,200 inhabitants.

THE FRENCH ISLANDS of the Caribbean are Guadeloupe (688 square miles) and Martinique (385 square miles), with a few smaller islands and half of St. Martin (shared with the Netherlands), all of them situated in the general area of the Leeward and Windward groups. Nearly half of Guadeloupe is forested and more than a quarter developed for agriculture. Martinique is divided about equally in four categories: arable, pasture, forest, and waste. The two main islands are thickly populated, having more than half a million people between them. Sugar, rum, and bananas are the chief products, but here, as in Jamaica and elsewhere, leaf-spot disease has seriously affected the banana plantations. Fort-de-France (population 60,000), on Martinique, is the largest town. Martinique and Guadeloupe were raised to the status of departments of France in 1947.

NETHERLANDS WEST INDIES. These are in two groups, with a total area of 383 square miles. The largest islands—Curaçao, Bonaire, and Aruba—lie off the Venezuelan coast. The remainder—St. Martin (shared with France), St. Eustatius, and Saba—are sandwiched among the Leeward Islands over 500 miles away. The rainfall in the larger islands is scanty, and only about 5 per cent. (some 12,000 acres) of the total area is cultivated; the greater part of the islands is better suited to pastoral use. But the chief importance of the Dutch possessions in the West Indies lies in the development of Curaçao and Aruba as refining centres of crude oil from the Venezuelan oil-fields; the refineries are among the largest in the world. The capital, Willemstad, on Curaçao, has some 75,000 inhabitants and a good harbour.

CENTRAL AMERICA

South-eastward from Mexico the continent tapers off in the narrowing isthmus of Central America, which has a total area less than a third of that of Mexico, and considerably less than that of Texas. There is less variety than in Mexico, and certain characteristics persist throughout. There is a backbone of highlands. The highest peaks are volcanic cones, a number of them active. Lava flows and ash deposits are widespread. Towards the Caribbean Sea the highlands are older mountains, deeply dissected, and worn-down hills. On the coast of this sea there are broader lowlands than on the Pacific—swamps and alluvial lands instead of mountains sloping to the sea.

The temperature of the lowlands is high all the year, with a greater range between day and night than between season and season. The average for every month is about 80° F., the result of a range from about 70° F. by night to 90° F. by day. At 3,000 feet altitude the temperature is very agreeable, averaging about 70° F. The rainfall varies greatly from place to place in accordance with the exposure and the topographic structure. As in Mexico, the trade winds are the chief rain-bearers, and on the Atlantic side, where there is direct exposure to those winds, there is no dry season and the rainfall averages above 100 inches. Lowlands and mountain slopes are clothed with tropical rain forest. On the Pacific coast and in the interior highlands the rainfall is considerably less; there is a dry season between December and April, when the trees in many places shed their leaves, and there is much scrubby and thorny vegetation. The racial elements are like those in Mexico, but with the addition of some English-speaking negroes on the Caribbean coast.

Almost throughout the territory there are similar resources, similar problems of development, similar people and common interests, yet the conditions are not favourable to political unity. There is no continuity of population, but rather a congeries of population groups each gathered round one chief nucleus and separated from its neighbours by miles of almost impassable country. None of the isolated population groups is strong enough to control the others, with the result that the area is divided up into

six independent republics—Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama, besides a British colony (British Honduras), and the Panama Canal Zone, which is controlled by the United States. To a large extent travel, even between adjacent countries, is by sea. Moreover, these population islands lack the advantage of true islands, that of being circumnavigable, so that travel from coast to coast of the same country is in some cases by a roundabout sea and land route.

These difficulties are being lessened by the spreading network of air routes, which already link all the important towns with Mexico, on the one hand, and South America on the other, while direct routes run to Florida and the West Indies. The position will also be much improved when the Inter-American Highway is completed. This great project, part of a larger scheme to link the countries of North and South America by a road system to be known as the Pan-American Highway, involves the construction of a through route from the Texas-Mexican frontier to Panama City—a distance of more than 3,000 miles. The work of construction was speeded during the Second World War, the countries concerned receiving aid from the United States, but recent progress has been slower. By 1951, 61 per cent. of the highway had been finished and another 30 per cent., though unpaved, was usable. There remained an impassable gap in western Guatemala, and others in Costa Rica and Panama, together totalling some 250 miles. Central America has been called a connecting link between North and South America; but so far it has been rather a barrier.

Agriculture is the chief industry in Central America, although less than 10 per cent. of the surface is cultivated. The more advanced Indian communities were agricultural before the Spanish occupation, and in large measure still carry on the same methods and cultivate the same crops. As in Mexico, maize occupies more land than any other crop. Sugar-cane, beans, and various starchy root crops are common.

In modern times certain commercial crops have become important, but the most important of all as an export commodity, coffee, occupies a very small proportion of the surface, and the exacting requirements of this crop (cf. p. 197) limit it to certain districts, the best of which are plateaus or high basins mantled with volcanic ash. The high quality of the product causes it to be in great demand in continental Europe. The industry is a Central American one, but European and United States interests have a strong hold on it.

Bananas (see p. 216) are second among the exports of Central America, but the cultivation of this fruit as now carried on is of modern and foreign origin. It demanded, for its inception, large amounts of capital and a high degree of organisation. Until comparatively recent times the Caribbean coast, where all the banana

estates lie, was an uninhabited wilderness. The inhabitants of the temperate highlands of this region had never tried to subdue the dense, fever-ridden forests of the rainy lowlands. Individual enterprise was helpless in the face of such obstacles. In a banana district it was necessary to build a network of railways radiating from a newly equipped port, to clear the forest, to plant and tend thousands of acres of bananas, to harvest the crop week by week in perfect condition on scheduled time, to be transported successively by man, mule, tramway, railway, and special refrigerating ocean liner to a United States or European port, and thence to be distributed by special railway cars. Thousands of negroes were brought as labourers from the West Indies, particularly Jamaica, and these have had to be housed, supplied with their everyday needs, protected against disease, and in some cases governed and policed. English and not Spanish is the language of the banana districts. The United Fruit Company of the United States is the largest of the organisations concerned.

Other crops are sugar-cane, principally for the domestic market, cacao, oil-seeds, and coconuts. Cacao is a commercial crop that has been growing in importance, particularly in Costa Rica. It replaced bananas in some of the older districts, where a banana blight, spreading uncontrollably, had infected the soil. Central America is a rather important source of supply of coconuts for the United States, being near enough to ship fresh nuts instead of the less bulky copra for oil only. Of the miles of coconut palms fringing the well-drained, well-watered beaches of the Caribbean coast, some belong to fruit companies and some to coastal Indian tribes.

Mineral industries play a minor part. Precious metals were mined in prehistoric times, and the Spaniards were mainly attracted to the mining districts; but large rich deposits are lacking, and small primitive workings are the rule, except in Nicaragua, where mining is on a bigger scale.

Forest industries are widespread, though their importance is not commensurate with the proportion of tree-covered land, which occupies nearly two-thirds of the whole area. Mahogany, Spanish cedar, rosewoods, and other less important cabinet woods, as well as dyewoods (such as logwoods), grow in various places on the Caribbean slope, and in some relatively moist forests on the Pacific slope, but the valuable trees are widely scattered among those of little value. There are unmixed stands of pine, suitable for structural timber, on sandy ridges of the Caribbean slope, but their isolated situation does not favour easy working. Dyewood exploitation continues in dry as well as moist forests, although adversely affected by coal-tar dye competition. Rubber-gathering has declined. Chicle is gathered in forests adjacent to the Mexican chicle territory. Of the numerous other forest resources, some, such as oil nuts, are still

potential, and some, such as Peruvian balsam, have been known and utilised for centuries.

Manufacturing industries have made much progress in the last two decades and are now both numerous and diverse, though they do not challenge the paramount position of agriculture. With the exception of factories concerned with the processing of coffee and other raw materials they are mostly confined to the production of goods for the home market, such as textiles, shoes, furniture, soap, cigarettes, and matches. Household industries survive in communities which preserve an Indian culture.

The bulk of the trade, both import and export, of the whole region is with the United States.

GUATEMALA is the most populous and productive of the six republics. It has a 200-mile coastline on the Pacific and one of 70 miles on the Caribbean, and meets at its frontiers four other countries: Mexico in the north and west, Honduras and El Salvador in the south, and British Honduras (to which it has laid claim for over a century) in the east. Mountains rising to nearly 14,000 feet occupy two-thirds of the land, other physical features being a large and undeveloped northern plain and low coastal strips. Both highlands and lowlands are densely forested, trees and jungle growth covering two-thirds of the whole area, which extends to 42,000 square miles (four-fifths the size of England). The greater part of the remaining third, apart from 2,300 square miles of permanent pasture, is cultivated land. The 2½m. people are largely concentrated on the Pacific side, on fertile slopes 1,000–5,000 feet above sea-level, and here is situated the capital, Guatemala City, with more than a quarter of a million inhabitants. Only small numbers are found on the Caribbean side (in spite of some important coffee and banana interests) and still fewer on the northern plain. The pure-blooded Indians, who constitute over half the population, are descendants of the Mayas and Aztecs, of whose distant civilisations there are numerous remains.

The best coffee is grown between the 2,000 and 5,000 feet contours. It accounts for 70 per cent. of the value of the total exports, bananas making up 20 per cent.; but large acreages are devoted to other crops for domestic consumption, notably sugar, maize, beans, wheat, rice, tobacco, and essential oils. Livestock include nearly a million cattle, two-thirds of a million sheep, and a third of a million pigs. The forests provide chiclé (for chewing-gum), cinchona (for quinine), and rubber, as well as timber, but there has been little development of their rich resources. Mineral resources, though varied, are likewise largely undeveloped.

BRITISH HONDURAS shuts off the undeveloped northern part of Guatemala from the Caribbean and is itself bordered on the north by the Mexican peninsula of Yucatan. The smallest and most

sparsely populated political division of Central America, it has within its 8,870 square miles (a little larger than Wales) only 67,000 inhabitants, of whom a third live in the capital and chief port, Belize. The coastal areas tend to be swampy and inland there is a gradual rise to a height of several thousand feet. Much of the interior is inaccessible, no less than 87 per cent. being covered with thick forest, and development is still in a pioneer stage. Logging, in which mahogany is especially important, has long been the dominant occupation, but the areas of convenient development along the rivers are becoming exhausted and the colony is looking more and more to other productive possibilities. So far the most promising are chicle, coconuts, and bananas. Foodstuffs are also produced for home consumption, notably cane sugar, maize, and rice, the total crop area being around 800 square miles—less than a tenth of the whole. The undeveloped and under-populated nature of the colony generally has encouraged the idea of using it as a settlement area for some of the surplus population of the British West Indies.

HONDURAS, largest of the Central American republics, is about the size of England and Wales. It has an east-west coastline of 330 miles on the Caribbean, and its land frontiers converge southwards to the Pacific, where the coastline is less than 50 miles. The republic therefore looks to the Atlantic rather than the Pacific, which carries only $6\frac{1}{2}$ per cent. of its maritime trade. Its population of 1½m. (chiefly mestizo) is a good deal scattered, and its capital, Tegucigalpa, with 93,000 inhabitants, is smaller than those of the other republics. In its coastal plains and elevated interior Honduras follows the pattern of its neighbours, but is distinguished from them in having the largest proportion of wasteland—nearly a third of its 60,000 square miles. Most of the remainder is covered with forest, only about $3\frac{1}{2}$ per cent. (2,100 square miles; 1½m. acres) being suitable for crops and $1\frac{1}{2}$ per cent. (850 square miles) for livestock. Within these limitations agriculture is actively pursued, particularly in the north, where large foreign corporations own extensive banana plantations. On higher ground the chief product is coffee, grown by small farmers. These two staple crops are supplemented by beans, coconuts, maize, rice, sugar, and tobacco; the raising of livestock is also important. In early Spanish days Honduras was the chief centre of production in Central America of gold and silver, which still provide one-eighth of the republic's exports.

EL SALVADOR, as large as the Netherlands, is the smallest of the republics and the most densely populated, with about 2m. inhabitants (largely mestizo). It is also the only one whose frontage is confined to the Pacific. Well over half its 13,200 square miles is forested and about a quarter is reckoned as of no potential value.

The remainder consists of fertile valleys and tablelands to the extent of 1,660 square miles (over a million acres) of arable land, and 620 square miles of pastures. Nearly 150 sizable rivers and streams, some of them harnessed to produce electric power, drain the mountains and empty into the Pacific along a 160-mile coastline. The disadvantage to El Salvador of having only this single coastline is partly offset by an arrangement with Guatemala for free access to the Caribbean port of Puerto Barrios, with which it is connected by railway. In recent years talks have taken place on proposals for a federation of the two republics.

High-quality coffee provides 80 per cent. of the exports. Useful secondary exports are cotton, sugar, and gold, but not all the cotton is exported: much of it goes to feed a new and efficient textile industry. Cereals, oil-seeds, tobacco, sorghum, and sugar are other crops. Cattle number three-quarters of a million, and pigs a third of a million. Outstanding among forestry products is balsam, from which resin is extracted, Salvador being the main source of world supply. San Salvador, the capital, with 160,000 inhabitants, is nearly 20 miles inland from its port, La Libertad.

NICARAGUA (57,000 sq. miles) is nearly as large as its northern neighbour, Honduras, but has much more low ground. The volcanic Central American chain, broken in the south by a low isthmus once considered as an alternative route for the Panama Canal, divides the country unequally, so that about three-quarters drains into the Caribbean and only a quarter into the Pacific. The swampy Caribbean coastline of 336 miles is over 100 miles longer than the Pacific. The land area of the Pacific slopes is, moreover, reduced by two large lakes with a combined area of nearly 3,500 square miles. Nevertheless, the Pacific side is the more important: here are concentrated most of the agricultural land and nearly 70 per cent. of the total population (mostly mestizo) of just over a million, and here, on the shores of the smaller lake, is situated the modern capital city of Managua (107,000), rebuilt after its destruction by an earthquake in 1931.

Over 43 per cent. of the country is forested and 29 per cent. water and waste. Under 5 per cent. is suitable for crops and 2 per cent. for pasturage, but a high proportion (21 per cent.) is classed as potentially productive though not in present use, the main reason being the slow development of communications, particularly to the eastward. Coffee is the mainstay of the agricultural industry, but the yield is low because most of it comes from small holdings lacking modern methods and equipment. Next in order of importance as export commodities come sesame (a modern and expanding development), maize, and rice (also grown for home consumption), and bananas (from big plantations on the Caribbean coast). Sugar is produced on the Pacific side, but not to such an extent as

the favourable climatic conditions make possible, coffee being more popular. Also on the Pacific side are found the largest herds of cattle. Forestry, on the other hand, is carried on in the east, along some of the principal rivers, though production is falling. Mineral wealth is largely confined to gold, which rivals and sometimes exceeds coffee in export value. Communication between the two coastal areas has been aided by a new road, which links up with the Inter-American Highway; before the route came into use surface travel was by way of the Panama Canal. Work is now (1953) proceeding on a project to link the two coasts by a waterway across the low southern isthmus. The project involves canalising the waters of the River San Juan, which separates Nicaragua from Costa Rica, and its completion would benefit both countries.

COSTA RICA (19,700 square miles; two-thirds the size of Scotland) is sandwiched between Nicaragua and Panama at a part of Central America where the mountains and coastal strips are confined within a minimum breadth of about 70 miles. The Pacific coastline of 360 miles is nearly three times as long as that along the Caribbean, having two large peninsulas which account for much of the difference. The heart of the country is a plateau or high basin bordered by volcanic peaks. Rivers are numerous on both sides of the central range and, besides feeding hydro-electric power stations, add valuable alluvial material to a soil already enriched by volcanic ash. An unusually high proportion (78 per cent.) of the country is under forest, and nearly 20 per cent. is available for farming (2,900 square miles arable; 850 square miles pastoral), leaving only about 2½ per cent. unworkable. Agriculture is mostly in the hands of smallholders and follows the familiar pattern of coffee on the uplands, bananas and sugar-cane on the lowlands, with the addition of abaca (manila hemp) and cacao on the Caribbean side, rice and maize on the Pacific side. There are few sheep and goats, but about 400,000 cattle. The only exploitation of timber is on the Pacific side, which also has a few gold deposits.

Coffee and bananas have pride of place among the exports, being well ahead of cacao, abaca, and sugar, the principal runners-up. The Caribbean port of Limon and the Pacific port of Puntarenas share most of this trade. Both are connected by rail with the capital, San José, which lies on the central plateau and is the home of 94,000 of the total population of 800,000. Most of the people are of European descent, showing as a community more coherence than is the case elsewhere in Central America.

PANAMA, southernmost of Central American republics, nearly as large as Scotland, is a rugged, jungle-clad neck of land, 480 miles long and nowhere a quarter as wide, lying roughly east and west. It is crossed by the Panama Canal, linking the Atlantic and Pacific Oceans, and is itself linked on to South America in the republic of

Colombia, of which it formed part before it broke away in 1903. Of its 28,500 square miles, little more than 500 square miles (350,000 acres) are cultivated. Bananas, cacao, and abaca are grown for export, and other crops include beans, maize, rice, sugar, coconuts, and rubber. Cattle number over half a million. Manganese and limestone are worked on a small scale. Imports are greatly in excess of exports, but services related to the canal provide useful invisible exports. The population of 800,000 is of mixed descent. About 150,000 live in the capital, Panama City, close to the Pacific terminal

RETURN OF SHIPPING AND TONNAGE THROUGH THE PANAMA CANAL

OCEAN-GOING TRAFFIC ONLY; TONNAGES IN THOUSANDS

Fiscal year ending June 30.	Vessels.	Net Tonnage ¹ (thousands)	Cargo Tonnage (thousands)	Fiscal year ending June 30.	Vessels.	Net Tonnage ¹ (thousands)	Cargo Tonnage (thousands)
1915	1,058	3,507	4,888	1933	4,162	21,094	18,161
1916 ²	724	2,212	3,093	1934	5,234	26,410	24,704
1917	1,738	5,357	7,054	1935	5,180	25,720	25,309
1918	1,989	6,072	7,525	1936	5,382	25,923	26,505
1919	1,948	5,658	6,910	1937	5,387	25,430	28,108
1920	2,393	7,898	9,372	1938	5,524	25,950	27,385
1921	2,791	10,550	11,595	1939	5,903	27,170	27,866
1922	2,665	10,556	10,882	1940	5,370	24,144	27,299
1923	3,908	17,206	19,566	1941	4,727	20,642	24,950
1924	5,158	24,181	26,993	1942	2,688	11,010	13,607
1925	4,592	21,134	23,956	1943	1,822	8,233	10,599
1926	5,087	22,906	26,030	1944	1,562	6,073	7,003
1927	5,293	24,245	27,733	1945	1,939	8,380	8,603
1928	6,253	27,229	29,615	1946	3,747	17,516	14,977
1929	6,289	27,585	30,647	1947	4,260	20,233	21,670
1930	6,027	27,716	30,018	1948	4,678	22,902	24,117
1931	5,370	25,690	25,065	1949	4,793	23,473	25,305
1932	4,362	21,842	19,798	1950 ³	5,448	28,013	28,872

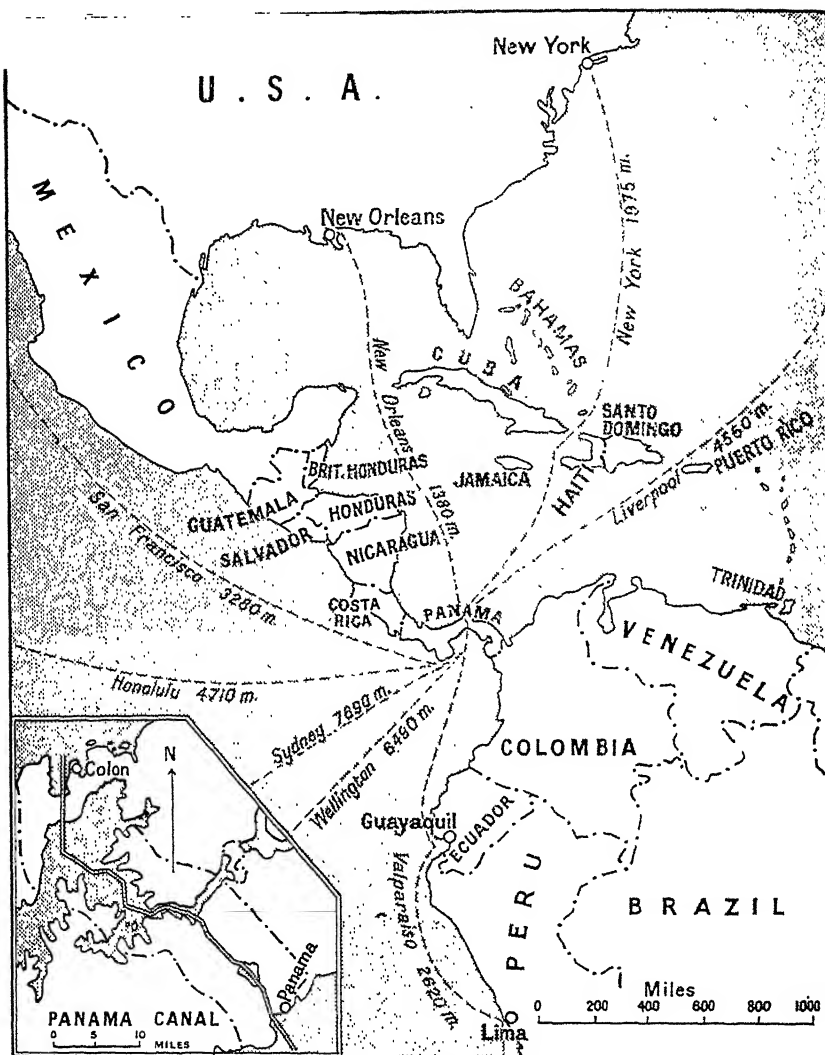
¹ Net tonnages based on Panama Canal measurement rules.

² Canal closed by landslides for 7 months.

³ In 1951, cargo tonnage 30m.; in 1952, 33·6m.

of the canal, and 60,000 in Colon, at the Caribbean terminal. Both cities are enclaves, excluded from the canal zone administration.

The **Panama Canal Zone** is a strip about ten miles wide running from north-west to south-east across the centre of the republic. It was granted in perpetuity by Panama to the United States in 1903 in return for a lump sum of \$10m., and an annual payment now standing at \$430,000. The canal, built by the United States and opened in 1914, is 50 miles long from deep water to deep water. The passage takes 6 to 8 hours. Three sets of locks have to be negotiated, but a plan to convert the canal into a sea-level waterway



THE PANAMA CANAL AS A GEOGRAPHICAL AND COMMERCIAL CENTRE

Showing its situation in relation to North and South America and its attraction as a nodal point for worldwide shipping services.

is under consideration. The administration was reorganised in 1951. Government is exercised by the Canal Zone Government, and commercial management is in the hands of the Panama Canal Company, which took over, with enlarged powers, the Panama Railroad Company. The headquarters of the Company are at Balboa, which stands at the Pacific terminal of the canal, not far from Panama City. The civilian population of the zone is about 50,000, nearly half of whom come from the United States. The table on page 801 shows both how traffic has varied with periods of war and trade depression, and the present post-war upward trend.

SOUTH AMERICA

This, the smaller half of the New World, has at least four-fifths of its area within the tropics, and hence yields chiefly tropical products; but here as elsewhere the temperate area, relatively to its extent, furnishes a greater abundance of commercial commodities, and it is in this part of the continent that the rate of increase in the production of such commodities and the development of means of distribution for them have been most rapid, and European immigration has been most constant. The most powerful South American country, Argentina, lies almost wholly in temperate latitudes.

The lofty chains of the Andes, on the west side of the continent, form an important climatic barrier. In the latitudes in which the trade winds prevail they arrest the moisture-laden winds from the Atlantic, draining the moisture out of winds that have already been partly drained in their course over the continent farther east. The western slopes of these mountains, on the other hand, receive in these latitudes no rain from the Atlantic, and as far as 33° S. little or none from the Pacific. On that side the tendency of the wind is to blow away from the land, and the rarefaction of the air on the narrow strip west of the Andes is not enough to counteract that tendency. There is also, flowing northwards along the west coast, the cold Humboldt or Peruvian current, which is accompanied by much upswelling of cold bottom water. The air over this current is cold and, if moving towards the land, is not likely to deposit any moisture over the warmer land surface. Hence the absolute desert, frequently entirely rainless, is along the actual sea coast. The Andes also constitute a great obstacle to communication between the east and west coasts. More than one railway reaches a height of upwards of 14,000 feet before attaining the tablelands between the principal chains of the mountains.

Some of the mighty rivers to the east of the Andes form excellent waterways. The Orinoco, in the north of the continent, is

navigable for steamers continuously for nearly a thousand miles. The Amazon is navigable without interruption to the base of the Andes, a distance of 2,600 miles from its mouth, and many more thousands of miles of navigation are afforded by its tributaries great and small; ocean liners regularly reach Manaus, 1,000 miles from the mouth. Many of these tributaries, however, have their navigable course greatly obstructed by falls and rapids. The value of the navigation of the Amazon is diminished by the paucity of population and products in the region through which it flows and by the similarity of the products in nearly the whole of its navigable course. The sole important article of trade is rubber. The inland waterway which is of most importance and likely to remain most useful to commerce in the future is that from north to south formed by the upper Paraguay and the lower Parana, a waterway which is uninterrupted from near the source of the former river, and which, like the Mississippi, brings hot and temperate climates into direct communication.

In general the populous areas are well served by railways, which in some cases also provide communication between adjoining states. In recent years rather more attention has been devoted to the development of roads, particularly the Pan-American Highway system, a scheme which aims ultimately to link all the countries of Central and South America with a master network of first-class motor routes. Much work remains to be done on this large and costly project, but its completion will undoubtedly have a considerable effect on cultural and commercial relations throughout the continent.

In the fifteen years 1936-51 the population rose by more than 30 per cent., as against 7 per cent. in Europe and 19 per cent. in North America, but it is still comparatively scanty except in a few areas such as the pampas of Argentina and the coffee lands of Brazil: probably not more than 110m. On this estimate, and reckoning the area of the continent at rather less than 7m. square miles, the average density of the population is about 16 per square mile. Whites of pure blood form only about four-tenths of the whole, negroes about one-tenth, and the remainder are either native Indians or people of mixed race. The white population in Brazil is of Portuguese origin, and Portuguese is there the official language; but elsewhere, except in Guiana, the whites are mainly of Spanish descent, and Spanish is the official language.

One effect on Latin America of the Second World War was to cut off the supplies of manufactured goods on which she relied. In consequence, internal industries have developed. A wide range of agricultural products has also been introduced in the attempt to achieve greater economic self-sufficiency. Inter-state trade within the continent has been increased and foreign investment attacked.

By 1949 British investments (totalling nearly £600m.) were only half what they were ten years earlier, and trade with Britain had also declined. Trade with the United States and Canada, on the other hand, showed a very large increase compared with pre-war years. Another feature has been the restoration of trade with Germany, which is striving with some success to regain her pre-war position in this respect.

BRAZIL

A federal republic with an area of 3.3m. square miles, Brazil is nearly as large as all the other states and territories of South America put together. It has frontiers with all of them except Ecuador and Chile, and an Atlantic coastline of some 5,000 miles. It is the world's fourth largest country, being exceeded in size only by the U.S.S.R., China, and Canada. Between 40 and 50 per cent. is under forest and another third (equivalent in size to Argentina) is classified as built-on or waste, while only $2\frac{1}{2}$ per cent. (but this is an area comparable with Uruguay) is arable land, and $15\frac{1}{2}$ per cent. (an area larger than Peru) is permanent pasture; the residue of $3\frac{1}{2}$ per cent. (equivalent to Ecuador) being assessed as potentially productive though not in present use. In the north are the broad, sparsely populated plains of the Amazon basin, crossed by the equator and covered with dense, swampy, tropical rain forest. Southward they rise to the central tablelands (*campos*), 1,000–3,000 feet above sea-level, which cover nearly a quarter of the country with savanna vegetation. Here also the land is very thinly peopled, since the coastal ranges to the east cut off the Atlantic moisture and give little opportunity for a profitable livelihood. Southward again the plateau rises into rolling hill country culminating in ridges which reach a maximum height of over 9,000 feet before dropping sharply to the sea. It is in this third area, crossed by the Tropic of Capricorn, that the centre of economic and political activity is found; in this limited region, comprising only about a sixth of the total, lives more than half the population of 55m. Most of the remainder are scattered along the coastal regions to the south and north. Politically, the country is divided into five regions, comprising twenty states, five federal territories, and a federal district in which is situated the capital, Rio de Janeiro.

Brazil is important both as a manufacturing country and as a source of agricultural products. The latter are of primary concern, since they not only provide employment for a far greater number of people but contribute much of the raw material required by industry, so helping to maintain a high degree of economic self-sufficiency.

The increasing demands of industry have, however, caused a drain on rural labour to the detriment of agriculture, and a movement back to the land is now being encouraged.

Coffee is the great crop; it grows so luxuriantly in the *terra roxa* (red soil) of the south-eastern region that the production is unsurpassed by any other country and the difficulty is one of limiting supplies to preserve an economic price. During the 1930s a drastic policy of burning the surplus output resulted in the destruction in all of 77m. bags.¹ In post-war years a state approaching equilibrium has been maintained, but controls of various kinds are still applied to safeguard against a repetition of the earlier experience. In 1951 the coffee plantations yielded a crop of over a million tons from 6½m. acres and provided more than half the total value of the exports. The normal annual crop is now over a million tons. The south-east devotes nearly as great an acreage to maize as to coffee, but this staple cereal, of which Brazil is one of the leading producers, is grown not only there but in most parts of the country as a subsistence crop, the total yield in 1951 being 6.2m. tons from 11.7m. acres.

Cotton, long established in the north-eastern bulge of Brazil, began to receive serious attention in the south-east when coffee slumped in the 1930s, and output in the latter area has so increased that to-day it contributes more than half the total yield of 600,000 tons (from an overall area of 5.2m. acres). Raw cotton has become the second export commodity, its value representing 10 per cent. of the whole. Very considerable areas are also devoted to rice (4.6m. acres), beans (4.2m. acres), cassava (2.3m. acres; the source of tapioca), sugar (1.9m. acres), and wheat (1.5m. acres). Other products, cultivated on a smaller scale, include cocoa, potatoes, tobacco, ground-nuts, and fruit. Most of these are grown to meet the needs of the home population, but cocoa, which flourishes along the east coast, is third in the list of exports (about 5 per cent. of the total) and makes Brazil second only to the Gold Coast as a producer, its crop in 1951 being 110,000 tons from 720,000 acres, against the Gold Coast's 214,000 tons from perhaps 1½m. acres. There are exportable surpluses of rice, beans, tobacco leaf, sugar, and fruit. Production of wheat was greatly increased under the stimulus of war but is still far from sufficient to meet home needs; and wheat and flour figure largely among the imports.

The pastoral industry is of special importance in the extreme south, in the region adjoining the grasslands of Uruguay, but other concentrations of livestock occur in the states of the south-east and north-east, as well as in the *campos* of the central plateau, which are used as breeding areas whence cattle are moved to the seaboard states for fattening. Cattle number some 50m., pigs 24m., sheep

¹ Nearly 5m. tons. A bag of Brazilian coffee is reckoned as 60 kilos, so that seventeen bags are just over a ton.

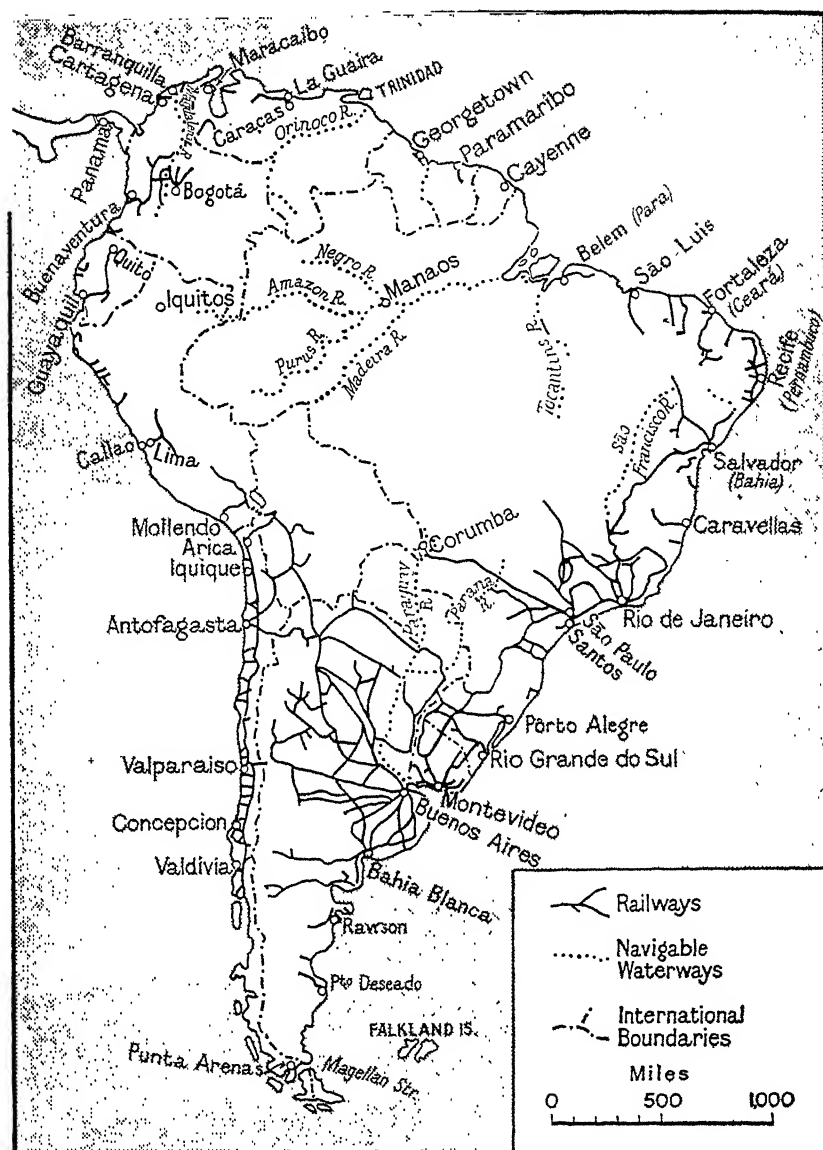
13m., goats 8m., and horses 7m. Only India, the United States, and U.S.S.R. have larger herds of cattle. These great numbers of livestock, besides supplying meat and dairy produce for home consumption, form the basis of an important but diminishing export of chilled and canned meat and hides. The wool clip, from the sheep farms in the far south, goes mostly to Brazilian textile mills.

The extensive forest lands, though furnishing many valuable commercial products, lie comparatively undeveloped, particularly in the case of Amazonia. Some timber is floated down the Amazon to its mouth, but most of the timber supplies come from the pine-woods of the Rio Parana, pine timber ranking fourth among the exports. Rubber is of some importance in the Amazon region, which, however, no longer enjoys the world supremacy it had before the development of the Malayan and Indonesian plantations and has a low yield per acre; rubber exports are now small, though the needs of local industries are met. Carnauba wax (used for making gramophone records), vegetable oils (of which the Amazon valley is probably the world's largest source), maté tea, Brazil nuts, balata gum, reptile skins, and sisal fibre may also be noted as products of the forests.

The mineral deposits are of great variety and in some cases of very considerable size, but exploitation has been slow. Iron ore of good quality is mined on the surface in the south-east, but output is small compared with the size of the reserves, which have been estimated at a quarter of the world's supply. Coal of not very good quality is mined in the southernmost states at the rate of about 2m. tons annually. Gold, manganese, bauxite, mica, and diamonds are secondary minerals worked in the south-east, and farther north oil has been found, though not in great volume.

Except for engineering products, local industries now go a long way towards meeting home requirements for manufactured goods. Before the Second World War, Brazil was already the foremost manufacturing country of South America, and the disappearance of foreign competition during the war years did much to aid the consolidation and expansion of her industries. Those concerned with the processing of food and the production of cotton and woollen textiles are the most flourishing, the mills providing an important export of cotton piece goods. Iron and steel mills and rubber factories have also seen a great expansion. To assist industry, the potentially great hydro-electric power resources are being increasingly developed.

In many regions capable of development, lack of communications is still a barrier to progress. The railways, totalling 22,000 miles, provide an excellent network over the populous regions of the south-east and south, and there is a smaller network in the extreme north-east, with Recife (Pernambuco) at its centre; but in other



SOUTH AMERICA : PRINCIPAL RAILWAYS AND NAVIGABLE WATERWAYS

coastal areas there are only varying lengths of disconnected track and in the main central mass none at all. Distances are great and the terrain does not favour a widespread development of railways. Plans have therefore been made to link isolated parts of the country with good highways. Energetic progress is being made to that end, but the fulfilment of the whole plan must be regarded as a very long-term project. Meanwhile, most of Brazil's roads (162,000 miles) are of unimproved dirt. Coastal shipping is naturally of great importance and the volume of traffic shows a steady increase. There is also a great deal of regular traffic on the navigable waters (22,000 miles) of the great rivers, but these do not effectively serve the main centres of population. The growth of air transport has been as notable as in other South American countries.

As a 'young' country with an expanding economy Brazil has received a steady flow of immigrants, principally from Portugal, Italy, and Spain, though there is a large proportion of German settlers in the southern highlands. More than half the people are white. The capital, Rio de Janeiro, is both the largest city and the chief seaport. Its spacious harbour is as valuable commercially as it is famous for its beauty. The second largest city, Sao Paulo, lies inland in the adjoining state at an elevation of about 3,000 feet, and has grown rapidly as the commercial capital of the coffee industry; it is connected by rail with the republic's second port, Santos, which surpasses Rio de Janeiro in the export of coffee. Salvador (Bahia) and Recife (Pernambuco) are seaports of the north-east region where cocoa, sugar, tobacco, and cotton are produced; Manaus (a thousand miles up the Amazon) and Belem (Para) serve the Amazon region. The ports of the temperate southern region yielding varied animal products are Rio Grande do Sul, Pelotas, and Porto Alegre, all of which are accessible only to vessels of small draught, on account of the bar at the entrance to the shallow lagoon on which they all stand. Everywhere the ports are inadequate for Brazil's commercial needs. Even at Rio and Santos congestion is chronic, and dredging and other port improvements are one of the main planks in the government's development programme.

The Brazilian unit of currency, the cruzeiro, has an exchange value of about 52 to the £. In 1950, imports were valued at Cr.20,313m. (about £390m.) and exports at Cr.24,913m. (£479m.). Since then there has been a big increase in both values, but Brazil finds great difficulty in settling her trading accounts. The chief imports are machinery and vehicles; the chief exports have been indicated earlier in this section. Most of Brazil's trade—as much as from a third to a half—is with the United States. Before the war, Germany had the second largest share of the import trade. The United Kingdom now holds that position, but by a narrowing margin. German imports into Brazil have made a rapid recovery,

and in 1951 tied with imports from Argentina for third place. In the export trade, the second and third places are also held by the United Kingdom and Argentina.

POPULATION OF PRINCIPAL TOWNS (1950)

Rio de Janeiro . . .	2,413,000	Santos	207,000
Sao Paulo	2,228,000	Belem (Para) . . .	261,000
Recife (Pernambuco) . .	534,000	Niteroi	190,000
Salvador (Bahia) . . .	424,000	Curitiba	184,000
Porto Alegre	401,000	Manaos	142,000
Bello Horizonte	360,000	Maceio	125,000
Fortaleza (Ceara) . . .	280,000	João Pessoa	121,000

THE GUIANAS

The only portions of the mainland of South America now remaining as possessions of European Powers are the Guianas—British, French, and Dutch—ranged along part of the north coast of the continent and extending inland till they reach the watershed of the Amazon basin. Broadly speaking, each comprises a strip of fertile lowland along the coast, and one or more river valleys affording access to the interior, which consists of huge blocks of the forested, undeveloped Guiana massif.

BRITISH GUIANA has an area of about 83,000 square miles—nearly the size of Great Britain—and is almost as large as the other two Guianas combined. It is split into two parts by the Essequibo river, which traverses the length of the territory from south to north but is interrupted by rapids. As much as 84 per cent. of the whole surface is forest and woodland, and a further 12 per cent. (10,000 square miles) is pastoral country, included in both these areas being a proportion of savanna. Built-on or waste land is assessed at 3,000 square miles ($3\frac{1}{2}$ per cent.) leaving less than $\frac{1}{2}$ per cent. (336 square miles; 215,000 acres) of arable land. Agricultural production is almost wholly confined to the lowland zone, which extends up to 30 miles in depth along the 270-mile coastline and is largely below sea-level. Behind this zone a second belt, about 100 miles deep, provides most of the territory's mineral and forest wealth. The remaining hinterland, partly mountain, partly savanna, produces hardly anything at present.

The three staple crops are sugar, rice, and coconuts. Sugar is grown on about 70,000 acres and, with its associated rum industry, provides more than half the exports, which in 1950 were valued at £10.6m. The cane is often brought to the sugar factory by barge on canals which were constructed during the Dutch occupation in the seventeenth and eighteenth centuries. The present output of

nearly 200,000 tons of sugar could probably be raised fairly easily by bringing back into use some of the abandoned land, which is plentiful. Rice, grown on 90,000 acres, is primarily a subsistence crop, but over a quarter of the yield is exported. Coconuts, produced on 35,000 acres, are almost entirely for internal consumption. Smaller acreages are devoted to coffee and cocoa, fruit, and ground provisions. The livestock industry is capable of great expansion, for though the potential grazing land is extensive the number of cattle reared at the present time is less than 200,000.

In the forests, balata is collected and some of the timber, notably greenheart, is worked, but much more valuable are the mineral products. Gold and diamonds are extracted from alluvial workings in the river valleys, and large deposits of bauxite lie conveniently accessible from the coast. The bauxite provides British Guiana's second export, most of it being taken by Canada, whose cheap hydro-electric power is used to convert it into aluminium. The Second World War gave a great impetus to production, which has increased fourfold since 1939 and amounted in 1950 to over 1½m. tons valued at nearly £3m.

Nearly half the population of over 400,000 are East Indians, who form the chief source of labour for the sugar plantations. Georgetown, the capital, at the mouth of the Demerara river, has a population of 85,000. As in the case of British Honduras, the small population and generally undeveloped nature of the territory have led to suggestions that British Guiana might relieve overcrowding in the British West Indies, but though a good deal of attention is being focused on the problems of development it does not seem likely that the colony can yet provide a home for many immigrants.

NETHERLANDS GUIANA, or SURINAM, is defined as an autonomous territory of the Kingdom of the Netherlands, having obtained self-government in 1950. Covering an area of about 55,000 square miles (nearly the size of England and Wales), it is similar in character to British Guiana, with a corresponding low coastal zone and a rising hinterland covered with forest and jungle growth. It lacks, however, the broad central valley that distinguishes British Guiana and has a much greater area of waste, approaching 14,000 square miles—25 per cent. of the whole. The forests cover nearly all the balance, only about one-fourth of one per cent. being classed as arable land, and practically none as suitable for livestock.

Rice is the principal crop and is grown on about 45,000 acres, the other main crops being coconuts (6,000 acres), coffee (5,000), citrus fruits (4,500), and sugar (3,500). The exploitation of forest resources is on a small scale and confined to areas along the lower courses of the rivers. Bauxite provides the one really big item in the export trade; production is rather higher than in British Guiana and nearly all the ore is sent to the United States for processing.

About half the total population of 219,000 are Asiatics. Paramaribo, with 78,000 inhabitants, is the capital and chief port, and the only large town. It lies on the Surinam river a dozen miles from its mouth. This river and others form a convenient means of communication with parts of the interior, but navigation of the upper reaches is prevented by rapids.

FRENCH GUIANA is the smallest and least developed of the three territories, with an area of about 35,000 square miles—about a sixth the size of France, of which it is an overseas department. More than three-quarters of the territory is covered with forest, and only some 7,000 acres are under crops. The mineral structure includes a good deal of gold, but the deposits are widely scattered and not easily worked. Cayenne, the capital and chief port, has nearly half the total population of 37,000. The notorious Devil's Isle is no longer used as a penal settlement.

VENEZUELA

The United States of Venezuela comprise 20 autonomous states, two territories, and a federal district, constituting a federal republic in the north of the continent, bordering Colombia in the west, Brazil in the south, and British Guiana in the east. Its 2,000-mile coastline looks northward, mostly to the Caribbean but also to the open Atlantic. There are four well-defined regions: the main mass of the Guiana Highlands in the south-east; the central plains, or *llanos*, occupying the basin of the Orinoco; the northern highlands, formed by the Andean and coastal ranges; and the lowlands around the great lake or lagoon of Maracaibo, in the extreme north-west corner.

The Guiana Highlands, rising towards the south to about 10,000 feet, occupy about half the total area of 352,000 square miles (four times the size of Great Britain) and are heavily forested, but have been little explored or exploited. The grassy central plains cover a quarter of the country and support about 20 per cent. of the population of 5m., while the northern highlands (reaching an altitude of over 16,000 feet in the Andes and nearly 9,000 feet along the coastal range) contain about 65 per cent. Another 10 per cent. of the population inhabit the Maracaibo lowlands, which are the smallest of the four regions but the chief source of the country's wealth.

Venezuela is to-day the world's second oil producer, and it exports more crude petroleum than any other country. The industry has grown very rapidly; the 1950 yield of 548m. barrels (78m. tons) was more than twice that of 1944, four times that of 1934, and nearly thirty times that of 1925. In 1951 production rose again to 626m.

barrels (89m. tons). Oil now provides 95 per cent. by value of all Venezuela's exports. The oil is found in three areas, of which the basin of Lake Maracaibo is by far the most important. Some of the fields lie beneath the waters of the so-called 'lake,' which is in fact a land-locked bay or lagoon of 5,000 square miles, opening on to the Gulf of Maracaibo and navigable throughout by shallow-draught tankers. About a fifth of the output is refined locally, but most of it goes to the great refineries in the Netherlands West Indies. The oil companies are almost entirely foreign-owned, the Venezuelan Government receiving half the profits. Another mineral of which production is increasing is gold, found towards the British Guiana border; it is fourth in the list of exports (after oil, coffee, and cocoa). Asphalt deposits occur in many places but few are worked. Other minerals are present, including newly discovered deposits of iron ore, which are expected soon to become a valuable export commodity.

The agricultural picture is less spectacular but is of great importance in the general economy. The trade winds blow parallel to the northern coast; rainfall is often scanty, and there are large areas of scrub in this zone. Where the rainfall is higher, sugar, cocoa, and tobacco are grown on the lowlands, and coffee in the temperate valleys, together with cotton in some drier parts. Maize, beans, and rice are widely grown; wheat, on the higher ground, to a lesser extent. Coffee and cocoa are export crops, the remainder subsistence crops. The aggregate of the arable land (under 6,000 square miles; about 3½m. acres) is only one-sixtieth of the total. By contrast, as much as 33 per cent. (116,000 square miles) is classed as pastoral country, but though the broad plains of the Orinoco are devoted to stock raising, the quality of the pasture is not first-class and lack of communications has retarded development. Livestock include 5½m. cattle, 1½m. goats, 1½m. pigs, but only 100,000 sheep.

An even greater area—40 per cent.—is covered with forest, but its products are potential rather than actual, and the fine tracts of cabinet woods await serious exploitation. Another 20 per cent. of the country is unused but capable of production of one kind or another. The key to its development lies largely in the extension of internal communications. There are only 623 miles of railways, comprising a dozen different lines operating on four different gauges. Of about 8,000 miles of roads only half are passable in all weathers. Vast tracts remain untouched by rail or road; in some, transport by cart, mule, and donkey is the rule, but even this is halted during the rains. River transport, however, offers considerable possibilities in the central area, where the Orinoco and its tributaries are navigable for about 6,000 miles. The main river, 13½ miles broad where it enters its low swampy delta, is navigable for a thousand miles, and ocean-going vessels are able to make the 270-mile journey up to Ciudad Bolívar, which ranks as a seaport.

The fishing industry, both sea- and fresh-water, provides a livelihood for many of the people. Manufacturing industries include—in addition to the oil refineries—sugar and textile mills and leather tanneries.

Caracas, the capital, lies 3,000 feet up on the southern slopes of the coastal range, 23 miles from its port, La Guaira. The latter is centrally situated on the coastline and through it enters the greater part of the imports. Exports, on the other hand, leave chiefly from the oil port of Maracaibo. As already noted, oil contributes an overwhelming proportion of the exports by value—£494m. in 1952 out of £520m., or 95 per cent. Nearly half the balance is accounted for by coffee exports, and cocoa is the only other notable item. In the United Nations *Year Book of International Trade Statistics*, petroleum and its derivatives, coffee, and cocoa are the only three items listed in the table of exports by principal commodities. Well over half the exports go to the oil refineries in the Dutch islands of Curaçao and Aruba, which lie off the coast of Venezuela, and well over a quarter go to the United States, the balance being shared by many countries. The United States supplies about three-fourths of the imports, prominent among which are iron and steel manufactures, machinery, and motor vehicles. The total value of the imports (£200–300m.) is considerably less than that of the exports.

POPULATION OF PRINCIPAL TOWNS IN 1950

Caracas	. 695,000	Barquisimeto (Northern Highlands)	. 105,000
Maracaibo	. 232,000	Valencia (Northern Highlands)	. 89,000

COLOMBIA

This republic, which is more than twice the size of France, occupies the north-western corner of South America, bordering upon Venezuela and Brazil in the east, Peru and Ecuador in the south. In the north and west its 2,000-mile coastline is broken near its centre by the narrow land mass of Panama, so that one part (the longer) is washed by the Caribbean and the other by the Pacific. The chain of the Andes, following the Pacific coast closely as it sweeps up from the south, spreads out northward into three roughly parallel ranges—the Western, Central, and Eastern cordilleras—which maintain a height of 10–14,000 feet. In the valleys between, in the adjoining coastal areas, and particularly on the healthy tablelands of the Eastern cordillera, live 96 per cent. of the total population of 11½m. The remainder of the people are dispersed over the greater area to the east—a broad, little-developed plain consisting of grassland in the north and tropical forest in the south.

The equator passes through the southern extremity of the country, but because of its varied altitudes Colombia offers considerable climatic diversity, including a tropical zone (up to 4,500 feet), a sub-tropical zone (4,500–7,500 feet), and a temperate highland zone (7,500–10,000 feet), while in the highest regions there is perpetual snow. Dry (*verano*: summer) and wet (*invierno*: winter) seasons usually alternate every three months, but this is not the experience everywhere. The great range of climate gives rise to a correspondingly great range of crops.

About 8,200 square miles (5½m. acres), or less than 2 per cent. of the total area of 440,000 square miles, is cultivated, the most fertile soil occurring in the Andean valleys in areas inconveniently remote from the sea, so that access is slow. In the sub-tropical zone and in the higher parts of the tropical zone, and especially in the Cauca valley, the most important crop is coffee, of which Colombia is the world's second largest source of supply, producing about a third (320,000 tons) of the amount grown in Brazil. The yield is of fine and mild quality, and the quickly recurrent seasons mean that picking can go on almost throughout the year. On the higher ground of the temperate zone wheat and other grains are common, but primitive methods of farming are the rule. In the lowlands, maize and rice, sugar-cane, cocoa, and bananas are grown. To all these products may be added a host of others: plantains, potatoes, beans, tobacco, fibres, cotton, oil-seeds, coconuts, and rubber.

Nearly a quarter of Colombia consists of natural grazing land and in consequence the livestock industry is important. There are over 15m. head of cattle as well as large numbers of sheep, goats, pigs, and horses. But the greater part of the country (63 per cent.) is covered with forests which have been little developed, and another 12 per cent. is barren. The mineral wealth is great, including gold and silver, whilst petroleum is now very important and ranks second to coffee amongst the exports. About half the yield of 5m. tons of petroleum goes to the Netherlands West Indies for refining. Colombian mines are the world's principal source of emeralds. Copper, iron, and salt are other mineral products.

The development of hydro-electric resources has given an impetus in recent years to the establishment of industries, some of which are concerned with the processing of raw materials such as coffee and sugar, while others, like the textile and steel industries, help to reduce the country's dependence on foreign supplies.

The rivers in the populous region flow northwards to the Caribbean and form Colombia's main outlets: the Magdalena is navigable for 800 miles and its tributary the Cauca for 155 miles. But in spite of the paramount importance of the Magdalena as a means of communication it is not without its disadvantages, for droughts sometimes render it unnavigable and shifting sandbanks are preva-

lent. In the less populous region in the east the rivers flow out of the country and into the Orinoco and the Amazon.

The terrain does not facilitate the development of railways and roads, and the problems are formidable in the case of lateral communications. The communities therefore tend to be isolated from one another. There are nearly 2,000 miles of railways, but they consist to a large degree of short lines connecting highland areas with their river ports. Motor roads extend over a network of 11,500 miles but are not always good, though they include three main north-south highways forming part of international systems. In one mountain area the problem of freight conveyance has been solved by an aerial cableway of 45 miles (the longest in the world); in another there is a similar cableway of 29 miles for both passengers and freight. Air development has made striking progress, and frequent services now link remote areas with the main centres.

Bogota, the capital, is within five degrees of the equator, but, by virtue of its situation 8,600 feet above sea-level, enjoys a healthy climate. It is 750 miles from the Caribbean ports of Barranquilla and Cartagena and 450 miles from the Pacific port of Buenaventura, with which it is connected by a somewhat roundabout rail route. In spite of its remote situation and indifferent communications it is the largest commercial and distribution centre.

In 1948 Colombia joined with Ecuador, Panama, and Venezuela in forming a commercial and economic union. All four territories were formerly united in the great but shortlived Republic of Colombia founded by Simon Bolivar in 1819. Most of the foreign trade is with the United States, which in 1950 supplied two-thirds of the imports and took four-fifths of the exports. In terms of paper pesos valued at 57 U.S. cents (about 5 to the devalued £), imports amounted to pesos 589m. in 1948, dropped to 516m. in 1949, and rose to 656m. in 1950. In the same three years the value of the exports rose steadily from pesos 505m. to 626m. and 768m. Coffee provides four-fifths of the exports and petroleum most of the remainder.

In 1951 the exchange value of the Colombian peso was reduced to 40 U.S. cents, or 7 to the £.

POPULATION OF PRINCIPAL TOWNS (1951)

Bogota	643,000	Cali	243,000
Medellin	330,000	Cartagena	111,000
Barranquilla	278,000	Bucaramanga	104,000

ECUADOR

Ecuador is the smallest of the four republics sharing the Pacific coast of South America. It is bordered on the north by Colombia and on the east and south by Peru, with whom it had to accept a settlement in 1942 favourable to Peruvian claims in a long-standing dispute over the ownership of a large tract of territory east of the Andes—Ecuador's Region Oriental. The term 'Region Oriental' survives with doubtful meaning at the present day. Estimates of the area of Ecuador are extraordinarily diverse. One calculation, officially adopted, puts it at 273,000 square miles, including two provinces said to constitute the Region Oriental and credited with 219,000 square miles, leaving only 57,000 square miles for the rest of the republic. United Nations publications give the area as 106,000 square miles, excluding 'Oriente Province.' Other estimates intermediate between 106,000 and 273,000 square miles add to the variety of choice.

Ecuador owes its name to the fact that its capital, Quito, is almost on the equator, where it lies at a height of 9,500 feet. Bordering the Pacific are undulating plains from 20 to 90 miles wide and about 400 miles long. Behind these is a highland area formed by two parallel chains of the Andes. East of these is the much disputed Oriente, now confined, according to cartographical representation of the 1942 settlement, to a small and almost uninhabited corner of the upper Amazon basin in the far north-east of Ecuador. Of the 106,000 square miles credited to the republic in United Nations statistics, apart from the Oriente, more than half is covered with forest and over a third is divided fairly equally between waste land and land potentially productive but not in present use. Though there remains only a small proportion of the country in active farming use—about 4 per cent. arable and 7 per cent. pastoral—agriculture is the mainstay of the republic's economy.

The two cordilleran chains, rising to over 20,000 feet, are separated by a valley which lies 8,000–10,000 feet above sea-level and is divided into ten basins or pockets by lava ridges formed by the neighbouring volcanic heights. Each of these basins is a centre of population, and between them they hold the greater part of the total population of 3½m. In this highland zone the main agricul-

tural occupations are the raising of livestock and the growing of cereals, fruit, and vegetables for home consumption. Livestock include 1½m. cattle and 3½m. sheep and goats. The sheep are confined to the highlands, while other livestock are scattered throughout the country generally.

Tropical farming is pursued in the coastal zone with the aid of irrigation, and this region is responsible for almost all the exports. Cocoa was for long the outstanding product, but the incidence of witchbroom disease caused output to decline from 47,000 tons in 1914 to 27,000 tons in 1950. During the Second World War cocoa was overtaken by rice, in spite of the primitive methods of rice cultivation and the low yield; and more recently coffee and bananas have come to the fore. Production of these four staple crops is variable, and all are capable of expansion, but it may be noted that in 1950 coffee headed the list of exports with 29·5 per cent. of the total value, followed by cocoa (28·5 per cent.), bananas (14·8 per cent.), and rice (13·2 per cent.). Important supplementary products of the lowlands are sugar (of growing significance), maize, cotton, and tobacco.

The Ecuadorean forests are the world's principal source of supply of that extraordinarily light wood, balsa. Other forest products include rubber, kapok, hardwood logs, tagua or ivory nuts (for the manufacture of buttons and collar studs), cinchona bark and the straw of the toquilla palm (of which Panama hats are made).

Among mineral resources oil has assumed a leading place and prospecting is still going on but the yield so far has been disappointing. Gold, silver, copper, and lead are also worked.

Manufacturing industries are on a small scale and include—in addition to textiles, sugar refining and oil refining—the making of Panama hats, so named because they reach the U.S. and European markets by way of Panama. It is a declining industry, suffering from competition from Japan and the Philippines.

Guayaquil, the chief port, is connected with Quito, situated in one of the highland basins, by a railway which rises to 11,653 feet; but communications generally are not greatly developed, and good roads are few. Trade is mainly with the United States, which in 1950 supplied two-thirds of the imports and took over half the exports. The total value of the imports was 586m. sucrés, and of the exports 870m. sucrés, or at the official rate of exchange (42 sucrés to the £) respectively £14m. and £21m. But there are commercial rates of exchange which reduce the sterling value.

POPULATION OF PRINCIPAL TOWNS

Quito	211,000	Guayaquil	82,000
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Galapagos Islands. To Ecuador belong the Galapagos (Tortoise) Islands, a group situated on the equator about 600 miles from the

coast, with an aggregate area of some 3,000 square miles and a population of about 1,350. Guano and orchilla moss (for purple dyes) are exported, and the group is a centre for commercial fisheries.

PERU

Peru is third in size of the republics of South America, its 514,000 square miles giving it an area over five times that of Great Britain. The 8½m. inhabitants, of whom rather more than half are whites or mestizos, and rather less than half are Indians, are distributed unevenly: most of the whites live along the coast, where the cool Humboldt Current tempers the tropical heat, and most of the Indians inhabit the mountains of the south as they have done since the days of the Inca civilisation. The Andes here form a broad belt, 200–250 miles wide, of plateaus and mountain chains dissected by deep longitudinal valleys and rising to over 20,000 feet in some of the loftiest heights in South America. The main watershed, the western cordillera, rises steeply from a narrow and arid coastal strip to form an unbroken barrier which hinders communication and hardly drops below 14,000 feet. On the landward side the heavily forested Andean slopes give way to the hot tropical lowlands of the Amazon basin in a vast, sparsely inhabited region which covers half the country.

Forests comprise about 56 per cent. of all Peru, barren land 21 per cent., and potentially useful land another 11 per cent. The balance of 12 per cent. is devoted to agriculture: 1½ per cent. to cultivated crops and 10½ per cent. to pasture. There are no broad fertile plains, and arable land is confined to strips developed along the river valleys. The dry, 1,400-mile ribbon of the coastal zone, 25–50 miles wide, is crossed by the courses of over 50 rivers; most of them dry up from time to time, but wherever the volume of water is sufficient irrigation is practised and the land intensively cultivated. Production for the export trade occurs chiefly in the northern sector of this zone, where cotton, sugar, and rice are the staple crops. In the central sector, cotton is supplemented by fruit and market-garden produce, while the southern sector specialises in subsistence crops for the local Indian population. Subsistence crops—wheat, maize, barley, oats, and potatoes—are grown more extensively in some of the valleys of the *sierra*, or highland region, corresponding to the concentrations of Indian population. The pastures of the *sierra*, though of indifferent quality, support large numbers of sheep (18m.), cattle (2½m.), llamas, alpacas, &c. (3½m.), and horses, mules, and asses (1m.). The llama is the traditional beast of burden.

Agricultural development of the trans-Andean region, or *montana*, is on a small scale, though there are extensive areas which are considered suitable for cultivation and stock raising. Difficulties of transport and the hot climate have militated against development, and the valuable timbers of the area remain largely untouched, though a great variety of useful products—rubber, balata, quinine, kapok, and medicinal plants—come from the forests of this region.

The Humboldt Current teems with fish, which attract a prolific bird life; and the extensive deposits of guano on the islands along the coast are a great asset to Peru's agricultural industry.

The republic is exceptionally rich in mineral resources, which include petroleum in the northern extremity of the coastal zone (16m. barrels in 1951), and copper, gold, silver, lead, zinc, iron, coal, and vanadium, often mined in remote workings high up in the Andes. Much of this wealth is as yet hardly touched, but even so Peru is one of the principal sources of vanadium and the fourth largest producer of silver; some of the copper mines were being worked centuries ago. As a result of this abundance, minerals (chiefly oil and copper) make up nearly half the value of the export trade. They do not, however, challenge the leading position of agriculture in the economic life of the country, since most of the proceeds of the oil-fields and mines go to foreign operators. Raw cotton and sugar, together providing, though in varying proportions, nearly half the value of Peru's exports, remain of foremost importance. The bulk of the cotton is of the Tanguis variety, a long-staple type which is native to Peru and in great demand in world markets. Total production in 1950 was 80,000 tons, of which a third went to Britain. Sugar production in that year amounted to 450,000 tons and over a fourth went to Chile. Secondary agricultural exports are wool, hides, skins, and coffee.

On the industrial side, an expanding production of textiles may be noted, also the traditional hand-weaving of woollen garments by Indian craftsmen. There is a petroleum refinery and a new iron and steel plant. These are supplemented by a number of industries which produce consumer goods; nearly all of them are centred in and around Lima, the capital, which lies midway along and behind the coast, close to its excellent modern harbour, Callao. Most of the imports for the whole country are brought in through Callao, but exports leave through a string of smaller ports situated nearer the centres of production, while the products of the Amazon region find their outlet through the river port of Iquitos to the Atlantic.

In 1950, imports totalled £67m. and exports £69m. The trade is largely in the hands of the United States and the United Kingdom, especially the former. Their combined shares of the imports in 1950 amounted to two-thirds of the total (U.S.A. 52 per cent., U.K. 16 per cent.). Their share of the export trade was much

smaller—less than half the total (U.S.A. 26 per cent., U.K. 17 per cent.)—but they still headed the list, though Chile, with 15 per cent. of the exports, was only two points behind the United Kingdom.

The seaports are linked by coastwise services which play an important part in the communications system. Because of the nature of the terrain, road and rail routes have been developed primarily to link the centres of production with the nearest ports. There is now a highway extending along the coastal zone (the Pan-American Highway), and another, 522 miles long, crosses the *sierra* to connect Lima with the navigable headwaters of the Amazon; but of a total of about 20,000 miles of roads only 1,250 miles are surfaced. The railways, grouped separately in the northern, central, and southern regions and comprising 2,600 miles of track, have been largely instrumental in opening up the mineral resources of the country. Two of the routes, by which the tablelands of the Andes are reached, are among the most remarkable in the world. The Lima–Oroya line attains in its passage through the western cordillera a height of 15,665 feet. The other Andes railway rises from the southern seaport of Mollendo by way of Arequipa to Lake Titicaca, attaining on the way an altitude of 14,688 feet. Lake Titicaca, itself situated at 12,500 feet, is the largest lake in South America, with an area variously estimated at 4,000–4,500 square miles, and is shared between Peru and Bolivia. The railway from Mollendo is one of the chief means of access to the latter republic, which has no coast of its own.

POPULATION OF PRINCIPAL TOWNS (1950 ESTIMATES)

Lima	835,000	Callao	88,000
Arequipa	97,000	Cuzco	56,000

BOLIVIA

Bolivia, twice the size of France, is the most thinly populated of the South American republics; its 413,000 square miles support little more than 3m. people—7½ to the square mile. Up to the time of its war with Chile in 1879–82 it had the advantage of a coastline on the Pacific, but since then it has been wholly an inland state, hemmed in by Brazil on the north and east, Paraguay and Argentina on the south, Chile and Peru on the west.

The western part of the country consists of a high plateau, covering 6,500 square miles and maintaining an average height of 13,000 feet, flanked on either side by the two main chains of the Andes, with peaks rising to over 21,000 feet. In the south the plateau is semi-desert; the northern part, which is better watered and contains the only substantial concentration of population, terminates in the

shallow depression which holds Lake Titicaca and carries the frontier with Peru (*q.v.*). The eastern cordillera—split by fertile valleys known as *yungas*—drops sharply beyond the plateau to the forested lowlands of the Amazon basin (with its northward-flowing rivers) and descends in a series of gently falling *sierras* to the valley of the Paraguay (with its southward-flowing rivers). These eastern lowlands, constituting about two-thirds of the whole country, are difficult of access and remain virtually undeveloped. Their tropical climate contrasts with the sub-tropical temperatures of the *yungas* and the cool or cold temperatures of the plateau.

The Food and Agricultural Organisation of the United Nations credits Bolivia with only one-third of one per cent. (850,000 acres) of arable land. On the plateau there is a limited production of potatoes and the hardier cereals; other cereals, cocoa, and coffee are grown in the *yungas*, which form the most productive areas; and sugar, rice, and cotton are cultivated on the few developed patches of the eastern plains. Forest products from these plains include a fluctuating yield of rubber and a good deal of quinine and quinine bark. Livestock include 3½m. cattle, 4m. sheep, 2m. goats, and 1m. pigs, as well as many llamas (used as pack animals), and alpacas (providing a small export of wool). Stock-raising is carried on in cleared areas in the Amazon basin, from which three refrigerating plants send their meat to La Paz by air.

It is estimated that two-thirds of the population gain their livelihood from agriculture and only 2 per cent. from mining, but commercially the mines are the dominant factor, providing over 95 per cent. of the exports. The main focus of activity is tin, which is found in the mountain area and alone provides three-fourths of the exports. Bolivia ranks next to Malaya as a producer of tin, supplying about a fifth of the world total. The principal mines have lately been acquired by the Government. Silver has been mined on the plateau since the Spaniards discovered the Potosi deposits in the sixteenth century. Lead, antimony, copper, wolfram, and zinc are also plentiful in the upland districts, and petroleum is produced near the Argentine frontier. There are signs that some of the deposits may be nearing exhaustion, and attempts are being made to put Bolivia's economy on a more stable footing by expanding agricultural industry. Long-term projects aim at providing new rail and road communications which will give the potentially fruitful eastern regions convenient access to the centres of population on the plateau.

Exports in 1950 were valued at £33½m., but much of this was the return on investments of foreign mining companies and was not available for the purchase of imports, which were valued at only £20m.

Existing railways, covering more than 2,000 miles and attaining

to heights of over 15,000 feet, extend from Lake Titicaca to Argentina, and link up with Chilean lines which climb steeply up the western cordillera from the free ports of Arica and Antofagasta, through which four-fifths of Bolivia's foreign trade passes. The Peruvian free port of Mollendo, the only other important outlet, is reached first by steamer across Lake Titicaca and then by rail. Roads cover more than 6,000 miles, but only half of them are passable in wet weather. In the north-east lowlands are broad, navigable rivers, tributaries of the Madeira whose rapids on the Brazilian side of the frontier are by-passed by railway. In the south-east, Bolivia is reached from Buenos Aires by river steamers which follow the course of the Paraguay.

Sucre, in the south of the plateau, is the legal capital, with a population of 40,000, but the seat of government and virtual capital is La Paz, not far from Lake Titicaca. Cochachamba is an agricultural centre, and Oruro a tin-mining centre.

POPULATION OF PRINCIPAL TOWNS (1950)

La Paz	321,000	Oruro	63,000
Cochachamba	81,000	Potosi	46,000

CHILE

The Republic of Chile comprises the whole of the Pacific coast south of Peru, together with the islands that fringe the coast, including part of Tierra del Fuego and the entire length of the Straits of Magellan. It is 2,800 miles from north to south but nowhere more than 200 miles wide, and in parts no wider than 40 miles—a pencil-like strip of territory that would just fit comfortably across the North Atlantic from Land's End to Nova Scotia. For the greater part of its length, the long frontier with Argentina follows the watershed of the Andes, whose slopes fill over half the width of the strip to an average height of 10,000 feet and culminate in the northern part in peaks exceeding 22,000 feet. A range of lesser heights (6–7,000 feet) along the coast is separated from the main cordillera by a longitudinal trough.

The northern portion of the country is a continuation of the desert strip along the coast of Peru; this gives place in the middle portion, between Coquimbo and Concepcion, to a 'Mediterranean' region which contains the bulk of the population, while further south again is a region which suffers progressively from an excess of wind and rain. The extremes of climate combine with the physical structure to render barren three-fifths of a country which occupies 286,000 square miles, or three times the area of the United Kingdom. About another fifth, occurring in the southern region,

comprises a forest zone, and the remainder is shared between arable land (14m. acres) and permanent pasture (17m. acres).

The agricultural products are mainly wheat, barley, oats, potatoes, and southern fruits—similar in fact to those of Spain and California. The temperature, however, is somewhat lower, so that oranges are not grown as a commercial product. Most of the agricultural production occurs in the central zone, particularly in the longitudinal valley, and in those areas to the north where it is assisted by extensive irrigation. Crops fluctuate greatly from year to year. Wheat is the most widely grown, and normally yields up to 1m. tons, followed by potatoes (up to half a million tons), and barley, oats, rice, and maize, each yielding 50–100,000 tons a year. Small quantities of several agricultural products are exported, including rice. Hemp fibre is also of increasing importance.

The livestock industry, including nearly 2½m. cattle and 6½m. sheep, is the source of small exports of fresh and frozen meat, as well as of a considerable quantity of wool, but large imports of beef cattle are made from Argentina across the passes of the Andes. The district around Valdivia, about 40° S., is largely given over to cattle, while more than half the sheep are reared in the extreme south—in Chilean Patagonia and Tierra del Fuego—where British settlers are responsible for much of the farming.

In Chile, however, as in most other countries on the western side of South America, mineral wealth is the dominating commercial factor. Minerals, mainly from the northern provinces, provide four-fifths of the value of Chile's exports. Copper alone accounts for more than half; its output is surpassed only by that of the U.S.A., and the reserves of copper ore are estimated to be about a third of the world total. Nitrates, worked in the northern desert, are another important asset. Early in the present century the Chilean supply of this valuable fertiliser enjoyed virtually a world monopoly, and although the competition of synthetic nitrogenous fertilisers has greatly reduced the dependence on Chile, the industry remains a very important one and supplies nearly a quarter of the value of all the exports. Two-thirds of the world's iodine is produced as a by-product of the nitrate works. Large deposits of iron ore are worked in the province of Coquimbo, while in the neighbourhood of Concepcion is found one of the few South American sources of coal, with an output of 2m. tons annually. Among a great many lesser mineral products may be mentioned gold and silver, manganese, molybdenum, borax (half the world's supply comes from Chile), sulphur, salt, and oil. Oil was struck in Tierra del Fuego in 1945 and is an up and coming industry, at present producing 2,000 barrels daily. Guano is plentiful along the coast adjoining Peru, but, as in that country, exports are prohibited.

Manufacturing industries have made tremendous strides in the

last few decades, strong contributing factors being the development of abundant hydro-electric power and the diversity of raw materials. Textiles, leather goods, chemicals, flour, iron and steel goods are among the wide range of products. The textile industry employs more than a fifth of the working population; all the wool used is indigenous, but large quantities of imported raw cotton are consumed.

Most of the internal trade is carried in coastwise shipping, which, however, suffers from a lack of good harbours in those parts where the population is most concentrated, though sheltered inlets and natural harbours are plentiful enough farther south. The railways consist* of one long central line—following the longitudinal valley and linking the centre with the north and south—with many short arms reaching out to the sea or into the mountains. Two arms extend across the Andes into Argentina, one to link Valparaiso with Buenos Aires, the other to join Antofagasta with Salta. There are about 5,500 miles of track, built in different sections on no fewer than five gauges. Private lines make up a fourth of the mileage, and most of these are British-owned. The road system of 27,000 miles (16,500 unimproved) is also based on main routes following the longitudinal valley.

The population of 6m. is 40 per cent. European and 60 per cent. mestizo. The capital, Santiago, is an inland city, and its port is Valparaiso, on a fine bay looking to the north. Here is received the great bulk of the imports, but exports are mainly from the northern ports of Antofagasta and Iquique, nearer the centres of mineral production. Punta Arenas, on the stormy Straits of Magellan, is the southernmost city in the world. In 1950, imports were valued at about £90m. and exports at £106m. Both the import and the export trade are mainly (about half) with the United States. The shares secured by other countries are not only comparatively small but vary from year to year. In 1950 the United Kingdom was second in the list of countries supplying imports (11·5 per cent.) and third in the list of countries taking exports (5 per cent.), Argentina being second in the latter class with 6 per cent.

POPULATION OF PRINCIPAL TOWNS (ESTIMATED)

Santiago . . .	1,120,000	Antofagasta . . .	100,000
Valparaiso . . .	245,000	Talca . . .	57,000
Concepcion . . .	100,000	Iquique . . .	57,000
Punta Arenas . . .	48,000		

ARGENTINA

Argentina, or the Argentine Republic, comprises a territory of more than a million square miles—nearly a sixth of the whole South American continent, whose 'tail' it shares with Chile. Extending half the length of the continent it exhibits a corresponding diversity of climate: from the tropical zone of the Chaco plains in the north, through the temperate zone of the central grasslands, or pampas, to the cool temperate zone of the Patagonian plateau (6-7,000 feet above sea-level) in the south. The frontier with Chile follows the main watershed of the Andes, which reach well over 20,000 feet, and give place eastwards to a broad and dry sub-Andine belt before dropping to the northern and central lowlands.

The district in which the bulk of the population of 17m. is established is the pampa region, stretching fan-wise around Buenos Aires for a distance of some 350-400 miles from that city. Here there are not only the greatest facilities for commerce but the climate is most favourable to production and suited to peoples of European stock; the soil is rich and deep. There is generally an ample rainfall in the eastern districts, but towards the interior the rainfall diminishes and irrigation becomes necessary for cultivation. To the north of this fertile and populous zone the forest-covered lowlands of the Gran Chaco, extending into Bolivia and Paraguay, form a vast, little-developed area with great potentialities. Swampy in summer, it has a dry winter season, the climate combining with the remoteness to hinder settlement. The sparse population is largely Indian. The undulating ground between the Chaco and the frontiers with Uruguay and Brazil has been described as a 'mesopotamian' region, from the position it occupies in the fork of the great rivers Parana and Uruguay.

In the present century the republic has undergone a rapid development, parallel with that in the United States and Canada. Streams of agricultural settlers have entered the country, principally from Italy and Spain, and though the numbers dwindled to a trickle during the Second World War, they have since increased again to over 150,000 a year. Economic development has been predominantly agricultural. To-day just over half the total area is classed as agricultural and ranching land, permanent pastures covering 41 per

cent. and arable land nearly 11 per cent., while forests occupy another 17 per cent. and the remaining 31 per cent. is waste or built-on.

Argentina stands among the great food-exporting countries of the world. It has become identified particularly with the production of meat, but the yield from crops is hardly less important. Cereals alone contribute about a third of the value of all the exports. Wheat is the main crop. It is grown on over 16m. acres in the drier parts of the pampas, the wheat lands forming a gigantic crescent from Rosario to Bahia Blanca, and the yield in normal seasons is around 6m. tons. Sometimes, not only wheat but crop production generally suffers a setback by reason of prolonged droughts. During such a period, around the turn of the half-century, the 1951-52 wheat crop was returned as only 2m. tons. Maize, which is grown in the wetter and warmer areas of the northern pampas, and before the war averaged nearly 8m. tons a year from 10m. acres, was reduced in 1949-50 to less than a million tons from 5m. acres, and in the following year yielded 2½m. tons from 6m. acres. Barley, oats, and rye each produce between half a million and a million tons a year.

Apart from cereals, the crop of outstanding importance is alfalfa, or lucerne, which flourishes widely in varying conditions of climate, and by providing excellent cattle food is a basic factor in the live-stock industry; about 14m. acres are devoted to it. Flax is cultivated for seed, and linseed has been one of Argentina's most valuable crops, averaging before the war nearly 1½m. tons from nearly 6½m. acres; but the 1951-52 crop was returned as only 313,000 tons, from little more than a million acres, and the average for the previous five years was no more than 715,000 tons. Exports are in the form of both linseed and linseed oil. While linseed has declined from its pre-war eminence, sunflower-seed, which has gained in favour as a source of edible oil, has gone rapidly ahead, from an average pre-war crop of 150,000 tons to 900,000 tons in 1950-51, though even this large crop, in the succession of droughty years then afflicting agriculture, was not proportionate to the increase in the area devoted to sunflowers—from 450,000 acres to 4m. acres.

Olive trees flourish, notably in the Mendoza district in the west, and the vine and sugar-cane are both cultivated—the vine on irrigated fields in the 'oasis' pockets of Mendoza and San Juan, near the base of the Andes, and sugar around Tucuman and Salta in the north-west. The elevation of Tucuman is only about 1,500 feet, but Salta lies nearly 4,000 feet above sea-level, and the cane-fields, although so near to the tropics, have been known to suffer damage from frost, which more frequently injures the grain crops.

Cotton is grown on over a million acres, mostly on the edge of the Chaco lowlands, yielding about 100,000 tons of ginned cotton;

and enough rice is grown in the north to meet internal needs. Potatoes come both from the pampas and the sub-Andine belt in sufficient quantities to allow, in some years, a good margin for export. From the northern forests the most important commercial product is quebracho, which yields an extract now very largely used in the tanning industry. Argentina is the world's chief source of supply of this commodity.

The cattle-rearing industry began intensive development when refrigerated sea transport was introduced in the 'eighties of last century. Imported pedigree cattle, especially Shorthorns and Herefords from England, have greatly improved the stock, and to a large extent the natural pastures have been superseded by alfalfa, with its superior fattening properties. Cattle now number 43m. They are concentrated in the damper parts of the pampas, within the arc formed by the wheat belt, and particularly in the 'mesopotamian' region between the Parana and the Uruguay, but to a lesser degree they are raised all over northern Argentina, where, however, harder conditions result in poorer qualities. The great estancias of earlier days have largely been replaced by mixed farms.

Sheep are even more numerous (55m.) than cattle, and much more widespread, the farms extending not only over the cattle country but over the whole of the Patagonian plateau as well, where the rainfall is insufficient for cattle rearing; there are considerable numbers also in Tierra del Fuego. Lincolns and Merinos predominate, and supply both wool and meat, the wool clip available for export amounting to about a tenth of the world's supply, a proportion surpassed only by Australia. But sheep-farming has declined in favour of cattle and cereals: in 1895 there were 20m. more sheep than there are to-day. Other livestock figures include 7½m. horses, 3½m. pigs, and 5m. goats, the last-named proliferating in the north of the republic.

The mineral wealth of Argentine is not great and such deposits as exist are usually too inaccessible for economic exploitation. Petroleum is an exception. It is found at Rivadavia (on the Patagonian coast) and in the northern foothills of the Andes, the total production being about half of what is consumed. In the absence of mineral resources, and especially of adequate supplies of iron and coal, the manufacturing industries are primarily concerned with the preparation of agricultural products. Meat refrigeration (centred in Buenos Aires, but with plants as far afield as Patagonia and Tierra del Fuego) is the largest single industry, followed by flour milling. Woollen and cotton textile mills produce goods for the home market, and sugar-refining and leather-tanning are also active industries.

No other South American country is so well served by railways. There are over 26,000 miles of them, though they suffer the

disadvantage of being on four separate gauges. As in the United States, they were the means used to promote the commerce on which immigration depended. Most of the construction was carried out by British capital, but in 1948 all the British-owned railways were transferred to the Argentine Government. The grasslands are particularly well served and there is through rail communication with Chile, Bolivia, Paraguay, and Uruguay. The absence of stone from the pampas has greatly hindered the making of roads, but latterly progress has been made with concrete highways and with the improvement of an extensive system of earth roads. In all, the roads make a network of over 250,000 miles. Distant parts of the country are being increasingly opened up as a result of the modern expansion of air services.

Among inland waterways, the Parana is navigable by sea-going vessels to Rosario (220 miles up-river from Buenos Aires) and Santa Fé (312 miles up-stream). River steamers can ascend to above the confluence of the Paraguay as far as the limit of the Argentine frontier. On the Uruguay river, along the eastern frontier, sea-going vessels can reach the Uruguayan town of Paysandu (300 miles from Montevideo), and river steamers continue to the falls near the Uruguayan town of Salto. The Pilcomayo, on the northern frontier, is navigable for 240 miles, and the Rio Negro, in the north of Patagonia, affords 300 miles of navigation.

The capital of the republic is Buenos Aires, which stands on the River Plate and is the largest city in the southern hemisphere. The Plate, formed by the combined waters of the Parana and Uruguay, is here more than 30 miles wide and is so shallow that only continuous dredging makes the passage of large ocean vessels possible. Modern harbour works have made Buenos Aires the chief port of the country, and more than half the foreign trade passes through it. Bahia Blanca, whose fine natural harbour serves the southern pampas, vies for second place with Rosario, serving the northern pampas from its position on the Parana.

Despite her wealth of resources, Argentina's economic future is beset by many difficulties. Under a popular President acting as virtual dictator, a policy of national self-sufficiency in a welfare state has been actively pursued. Foreign-owned railways and other public services have been expropriated and nationalised. In 1950 the whole of the livestock industry was placed under state control, from ranch to refrigerator. Four-fifths of the total meat production is absorbed locally, and the consumption per head is the largest in the world—240 lb. against 144 lb. in the United States. Meanwhile, industrial and trade problems have multiplied. A feature of the foreign trade in post-war years has been the bulk buying and selling of imports and exports; but Argentina has had difficulty in fulfilling her contracts to supply beef to the United Kingdom, traditionally her

largest customer, though the pre-war supply of 400,000 tons a year has been cut down by half. The question of price has been a source of trouble, with complaints of exorbitant demands on the one side and of unwillingness to pay the world rates on the other—not merely the mutual complaints natural to bargaining, but serious disputes threatening a deadlock and significant of weakness in the commercial situation. One of the advantages enjoyed by Argentine beef before the war was that it was shipped in a chilled, not frozen, condition. This was not practicable during the war; since then it has been agreed to revert to the dispatch of chilled beef, but the change-over has been delayed, on account of technical difficulties and dispersal of the skilled staff. Critics allege that the 'new deal' has favoured the urban worker at the expense of the land worker and encouraged a drift away from the land. A complicating factor in all trade arrangements has been the adoption of multiple exchange rates for imports and exports, according to the classification of goods as basic, preferential, and non-essential.

The following tables, based on the United Nations *Year Book of International Trade Statistics*, show the variation in trade in the

SPECIAL IMPORTS, c.i.f.: PRINCIPAL COMMODITIES

Values in Millions of Pesos and Percentages of Total

Principal Groups.	1948.	1949.	1950.
<i>Total</i> . . .	6,190 (100%)	4,642 (100%)	4,821 (100%)
Foodstuffs . . .	260 (4%)	148 (3%)	277 (6%)
Timber and products . . .	415 (7%)	309 (7%)	373 (8%)
Textiles . . .	588 (9.5%)	866 (19%)	567 (12%)
Fuels and lubricants . . .	693 (11%)	489 (10.5%)	593 (12%)
Iron and manufactures . . .	840 (14%)	756 (16%)	737 (15%)
Machinery and vehicles	1,807 (29%)	999 (21.5%)	967 (20%)
	(74.5%)	(77%)	(73%)

IMPORTS: PRINCIPAL COUNTRIES OF ORIGIN

Values in Millions of Pesos and Percentages of Total

Imports from	1948.	1949.	1950.
<i>Total</i> . . .	6,190 (100%)	4,642 (100%)	4,821 (100%)
United States . . .	2,287 (37%)	690 (15%)	787 (16%)
United Kingdom . . .	775 (12.5%)	721 (15.5%)	569 (12%)
Italy . . .	549 (9%)	742 (16%)	348 (7%)
France . . .	130 (2%)	465 (10%)	702 (14.5%)
Brazil . . .	521 (8%)	357 (7.5%)	460 (9.5%)
Belgium-Luxembourg . . .	415 (7%)	223 (5%)	53 (1%)
Netherlands Antilles . . .	235 (4%)	180 (4%)	163 (3%)
India . . .	153 (2.5%)	271 (6%)	196 (4%)
Germany . . .	13 (0.2%)	11 (0.2%)	106 (2%)
Total above countries	5,078 (82%)	3,660 (79%)	3,384 (70%)

three years 1948, 1949, and 1950. The multiplicity of exchange rates does not permit of any attempt to value the trade in terms of sterling. In 1950 the official rate for the paper peso (previously valued at nearly 30 U.S. cents.) was reduced to 20 cents., or 14 pesos to the £; but this sterling rate was only for basic exports and preferential imports, while for preferential exports the rate was 21 pesos to the £.

SPECIAL EXPORTS, f.o.b.: PRINCIPAL COMMODITIES

Values in Millions of Pesos and Percentages of Total

Principal Groups.	1948.	1949.	1950.
<i>Total</i> . . .	5,542 (100%)	3,719 ¹ (100%)	5,427 (100%)
Cereals and cereal products . . .	2,663 (48%)	1,277 (34%)	1,213 (22%)
Meat and meat products . . .	662 (12%)	749 (20%)	593 (11%)
Milk, butter, cheese . . .	167 (3%)	75 (2%)	163 (3%)
Animal fats, bones, etc. . .	273 (5%)	163 (4%)	294 (5%)
Hides and skins . . .	419 (7.5%)	482 (13%)	690 (13%)
Wool . . .	413 (7.5%)	349 (9%)	873 (16%)
Vegetable oils, oil-seed cake, etc. . .	524 (9.5%)	309 (8%)	825 (15%)
Quebracho extract and other forest products . . .	101 (2%)	87 (2%)	229 (4%)
	(94.5%)	(92%)	(89%)

¹ Note the effects of drought.

EXPORTS: PRINCIPAL COUNTRIES OF CONSIGNMENT

Values in Millions of Pesos and Percentages of Total

Exports to	1948.	1949.	1950.
<i>Total</i> . . .	5,542 (100%)	3,719 (100%)	5,427 (100%)
United Kingdom . . .	1,536 (28%)	849 (22%)	973 (18%)
United States . . .	537 (10%)	399 (11%)	1,109 (20%)
Italy . . .	476 (9%)	339 (9%)	359 (7%)
Brazil . . .	260 (5%)	405 (11%)	430 (8%)
France . . .	236 (4%)	189 (5%)	357 (7%)
Belgium-Luxembourg . . .	323 (6%)	163 (4%)	112 (2%)
Netherlands . . .	220 (4%)	161 (4%)	266 (5%)
India . . .	215 (4%)	117 (3%)	133 (2.5%)
Spain . . .	382 (7%)	179 (5%)	50 (1%)
Germany . . .	133 (2%)	153 (4%)	264 (5%)
Total above countries	4,318 (79%)	2,954 (79%)	4,053 (75%)

POPULATION OF PRINCIPAL TOWNS (1947)

Buenos Aires . . .	3,000,000	Santa Fé . . .	168,000
Rosario . . .	761,000	Mendoza . . .	110,000
Cordoba . . .	352,000	Mar del Plata . . .	105,000
La Plata . . .	268,000	Bahia Blanca . . .	93,000
Tucuman . . .	172,000	Parana . . .	84,000

URUGUAY

Uruguay is not only the smallest of the South American republics (roughly half as large again as England), it is also the most thickly populated and the most consistently low-lying. On the map its comparative smallness is emphasised by the fact that it is driven, wedge-like, between the two largest republics—Brazil to the north-east, Argentina to the west. From a broad base on the shores of the River Plate and the Atlantic Ocean the land frontiers converge northwards to form the tip of the wedge, the frontier with Argentina following uninterruptedly the course of the Uruguay river. The population of 2½m. is predominantly of European origin; about a third of the total live in Montevideo, the capital, which is one of the great cities of South America and has a first-class modern harbour, handling nearly all the country's foreign trade. In the interior the population presses more thickly upon the cultivated belt than upon the pastoral regions; over the whole country the average density is 32 to the square mile.

Lying well outside the tropics, in latitudes corresponding with those of Morocco, Uruguay is favoured with a warm and pleasant climate marking a transition between the sub-tropical and temperate zones. The undulating grassy terrain nowhere reaches 2,000 feet above sea-level and is ideally suited to pastoral occupations, which dominate the life of the country. Over two-thirds of the total area of 72,000 square miles consists of pastures; cultivated land occupies another 7½ per cent. of the total, and the proportion of land built on or lying waste is about 21 per cent. Areas covered by forests occur chiefly in riparian strips and amount to only 3 per cent. of the whole—a remarkably low proportion for a South American country.

Cattle-raising and sheep-raising vie with each other in claiming the greater share of the pastoral industry, and between them they usually account for about three-quarters of the exports, though the proportion rose to about 90 per cent. in 1950, when wool provided as much as 60 per cent. of the exports, meat 17 per cent., and hides and leather 11 per cent. Britain takes the greater part of the meat and the United States the greater part of the wool, which is a much more valuable product. In 1951 there were about 8m. cattle and 23m. sheep. In recent years there has been a tendency to favour

production of wool because of the high prices it has fetched, but the greater stability of the demand for meat may well restore the pre-war emphasis on cattle. Already the government is stimulating meat production by various means, not least by subsidising the transport of livestock from regions distant from the meat-packing stations.

Normally, agricultural and farm products provide over 20 per cent. of the exports. In general the soil is not of good quality for easy crop production, and cultivation on a large scale is confined to an east-west belt behind the coastline of the River Plate. Production of wheat has been assisted by government price guarantee, and a yield* of up to half a million tons is harvested from 1½m. acres—enough to meet all internal needs and give an exportable surplus. Other main crops are maize, linseed, and sunflower seed. Before the war, maize averaged over half a million acres yielding 140,000 tons. The area planted has since declined to 400,000 acres, and with unfavourable weather conditions the crop in 1949 was under 70,000 tons. Flax, for linseed, is also grown on some 400,000 acres, and the crop of seed averages about 100,000 tons. The seed yields 25–30 per cent. of its weight in oil, and about four-fifths of the crop is exported in that form. As in Argentina, sunflower seed has come rapidly into favour, and at the turn of the half-century its acreage and output were about half that of linseed.

Crops grown on a comparatively small scale and fluctuating in yield include barley, ground-nuts, rice, alfalfa (lucerne), beans, potatoes, sugar-beet, and tobacco. A great deal of excellent fruit, including grapes for the making of wine, is also produced; oranges are especially prolific. Minerals are scanty, and coal and oil have to be imported. There are deposits of marble, granite, sand, and talcum, and gold is worked on a small scale.

Meat-packing plants are the oldest and most important of the industrial establishments, and the extent of the business has made the small towns of Fray Bentos and Paysandu, on the Uruguay, well known throughout Europe. In addition to preparing frozen and chilled meat, canned meat and meat extract, the factories deal with a multitude of by-products. The dressing of hides and skins is similarly of long standing. Newer industries, mostly developed after 1939 under the impetus of wartime shortages, include the manufacture of textiles and leather goods, chemicals, and cement, but the range of consumer goods is wide. Industries of all kinds are nursed by government controls and subsidies, even where the cost of production might be regarded as uneconomical, and nearly every manufactured export has to be protected by a subsidy to make it saleable abroad. Uruguay prides itself on being the most advanced welfare state in South America; in 1952 it abolished the office of President and entrusted all executive authority to a National Council.

The republic is well provided with communications, no part of it being difficult of access. The Uruguay river is navigable as far as Salto (see under Argentina), and also gives access to its big tributary, the Rio Negro, which flows across the country from east to west. The railways radiate from Montevideo in a standard-gauge system covering about 1,800 miles; most of them were British-owned until the end of 1948, when they were acquired by the State. The road network is perhaps the best in South America.

The foreign trade returns are officially quoted in U.S. dollars. Imports (special trade, c.i.f.) declined from \$215m. in 1947 to \$201m. in 1948 and \$182m. in 1949, but picked up again to \$201m. in 1950—equivalent, at the devaluated rate of sterling, to £72m. The imports cover a wide range of goods, with no specially prominent item, raw materials as a class forming a full quarter of the total in 1950, and machinery and motor vehicles of all sorts another quarter. The United States, the United Kingdom, and Brazil have the biggest shares in the import trade. During the same four years, exports (special trade, f.o.b.) increased steadily in value from \$162m. in 1947 to \$251m. in 1950, the latter figure being equivalent to £91m. The chief commodities furnishing the export trade have already been indicated. The chief buyers are the United States and the United Kingdom.

POPULATION OF PRINCIPAL TOWNS (ESTIMATES)

Montevideo	.	.	.	850,000		Salto	.	.	.	48,000
Paysandu	.	.	.	50,000		Mercedes	.	.	.	33,000

PARAGUAY

Like its northern neighbour Bolivia, Paraguay is an inland republic; its other neighbours are Argentina, on the west and south, and Brazil on the east. But, unlike Bolivia, it has no really high ground, and the only range of hills, running from north to south through the eastern part of the country, rarely exceeds a height of 2,000 feet. The Tropic of Capricorn crosses the centre of the republic, dividing it almost equally into tropical and temperate zones. A more effective division, however, is that created by the Paraguay river, which flows from north to south and forms a tangible line of demarcation between the Oriental, the habitat of over 95 per cent. of the population, and the little developed Occidental, or Paraguayan Chaco. Of a total area of 157,000 square miles the Oriental accounts for 61,700 square miles (an area somewhat larger than England and Wales) and the Occidental for 95,300 square miles (a little larger than the whole of the United Kingdom). The total population is about 1½m., mostly mestizo.

The Chaco is flat and large parts of it are subject to flooding in the summer months: as much as three-quarters of the whole country is classified as unused. The sub-tropical forests of the Oriental cover another 20 per cent. of the total area, and only 4 per cent., or 6,000 square miles, is devoted to agricultural and pastoral industry. The arable land consists for the most part of forest clearings in the Oriental, where the soil of decomposed sandstone is remarkably fertile; for stock-raising there are tracts of savanna in both the eastern and the western zones.

Stock-raising is an important industry, and though meat exports declined steadily in quantity from 48m. lb. in 1946 to 18m. lb. in 1950, hides and canned meat together provided nearly a fourth of the value of all the exports in the latter year. According to a live-stock census in 1951, the number of cattle is nearly 3½m., but sheep, goats, and hogs together total only just over half a million. The forests, the greater part of which are still untouched, yield excellent timbers, which in 1950 provided over a fourth of the exports in value, and another sixth was accounted for by quebracho extract (produced chiefly in the Chaco and used in the tanning trade). Yerba maté, a strongly flavoured tea, is also a forest product as well as a plantation crop. The remainder of the outgoing trade is made up principally of cotton (20 per cent. of the total exports in 1950), tobacco, and vegetable oils.

To a large extent, Paraguay is self-supporting in foodstuffs. Maize is the principal subsistence crop, and rice, sugar, and soya are also grown, but there is not much wheat, and most of the country's needs in this respect are met from abroad. Cattle are also a top priority import to supplement local supplies for the meat factories. Oranges were formerly an important product, the trees growing wild or cultivated in many parts of the republic, but marketing difficulties have led to their virtual disappearance from the list of exports. The considerable mineral wealth, particularly in the form of deposits of iron ore, manganese, kaolin, and copper, has not yet been seriously exploited. Industry is also on a small scale, and, with the exception of meat-canning factories, saw-mills, and plants for quebracho extract, serves internal requirements only.

The Parana and Paraguay rivers, which enclose the southern part of the country and meet at its south-western extremity, provide the most valuable means of communication. Asuncion, the chief port and capital, stands on the Paraguay and receives annually some 4,000 steam vessels with a draught of up to 12 feet. These vessels make the journey from Buenos Aires, a thousand miles to the south, in five days. Asuncion is also linked with Buenos Aires by rail, and 455 miles of privately-owned lines in Paraguay are used for industrial purposes. Roads suitable for all-weather traffic cover about 3,000 miles.

Argentina is the biggest factor in both the import and the export trade. The United States and the United Kingdom also share in both, but Uruguay takes more exports than either. Paraguayan currency has multiple exchange rates. At the official rate in 1950, the value of the imports was nearly £10m., and of the exports nearly double. The official rate greatly magnified the real value, and in 1951 the currency was drastically devalued.

POPULATION OF PRINCIPAL TOWNS (ESTIMATES)

	Asuncion . . .	206,000		
Encarnacion . . .	38,000		Concepcion . . .	34,000

FALKLAND ISLANDS

These islands, situated 300 miles to the east of the Straits of Magellan, have been in continuous British occupation since 1833. They consist of two main islands—East and West Falkland—separated by a long channel and surrounded by numerous small islands. East Falkland (2,580 square miles) is about the same size as the English county of Devon; West Falkland is smaller by about a fifth. Both have a deeply indented coastline and in each the highest land rises to upwards of 2,000 feet. The climate is not a great deal colder than that of London, with which the islands correspond in latitude, but because of the prevalent strong winds conditions are considerably more rigorous. Vegetation is sparse and the soft peaty soil is covered mainly with grass. Almost the sole occupation is the rearing of sheep, which number over 600,000 and produce about 5m. lb. of wool for export. Tallow, obtained by boiling the carcasses, is a useful secondary product and there is prospect of the export of frozen mutton when the necessary refrigerating plant has been established. The population is almost wholly of British descent and numbers fewer than 2,500, of whom about half live in Stanley, the capital, at the head of a fine harbour in East Falkland. There are no roads apart from those in Stanley.

The colony has a number of scattered dependencies far to the south and east: South Georgia, South Shetlands, South Orkneys, and the South Sandwich Islands, besides a big sector of Antarctica which includes Graham Land. Much of this territory is the subject of overlapping claims by Argentina and Chile. Whaling is carried on by the chief maritime Powers under international regulations, the annual production of oil being around 150,000 barrels—in 1950–51, 152,000 barrels, valued at £2½m. Seal oil is also extracted. The whalers, many of which are Scandinavian, use bases in South Georgia and the South Orkneys.

AUSTRALIA AND POLYNESIA

AUSTRALIA

The vast island continent of Australia has an area of nearly 3m. square miles, and is accordingly almost exactly equal in extent to the United States of North America, exclusive of the territory of Alaska. A good deal more than one-third of it lies within the tropics, but the great bulk of its population is to be found in the region outside of that belt. Most of the inhabitants, moreover, are found within two or three hundred miles of the coast, and from the nature of the climate this can never be otherwise.

The coastline of this vast island is remarkable for its long stretches of uniform character, without inlets that can be made use of by shipping even for shelter. The principal exceptions to this character are on the eastern side, and in some parts of the north-west.

To the north of Hervey Bay, on the east coast, numerous coral reefs rise to the surface of the water, making the seas somewhat dangerous to shipping, and about one degree north of the Tropic of Capricorn there begins a series of coral reefs such as are to be seen nowhere else in the world over the same extent of sea. These form together what is known as the **Great Barrier Reef**, which extends for a distance of about 1,200 miles, advancing into the latitudes of Torres Strait, which it nearly closes. Its widest part is in the south, where it extends for about 100 miles from east to west, and in that part also it lies farthest from the coast. As it narrows towards the north it comes nearer to the coast, being in many places within ten miles of the land, opposite the promontories, and generally not more than fifteen or twenty miles distant. At low tide the surface of the reef is just about the level of the surface of the water, and at all states of the tide the border of the reef can be distinguished by the strong breakers that wash over it. The reef, however, is not continuous. It is broken up by many deep channels, some of which are narrow, others from ten to twelve miles wide. To seamen these channels are of great importance, since they allow of a choice of routes between the seaports in the east of Australia and Torres Strait. The route within the Barrier Reef along the Australian

coast has the advantage of a calm and beautiful sea owing to the protection which the reef affords, and is that now generally used. But this route is one that requires careful navigation, and above all at night, when the reef cannot be made out at a greater distance than half a mile. By day it is visible at a distance of four miles from the bridge and seven miles from the rigging.

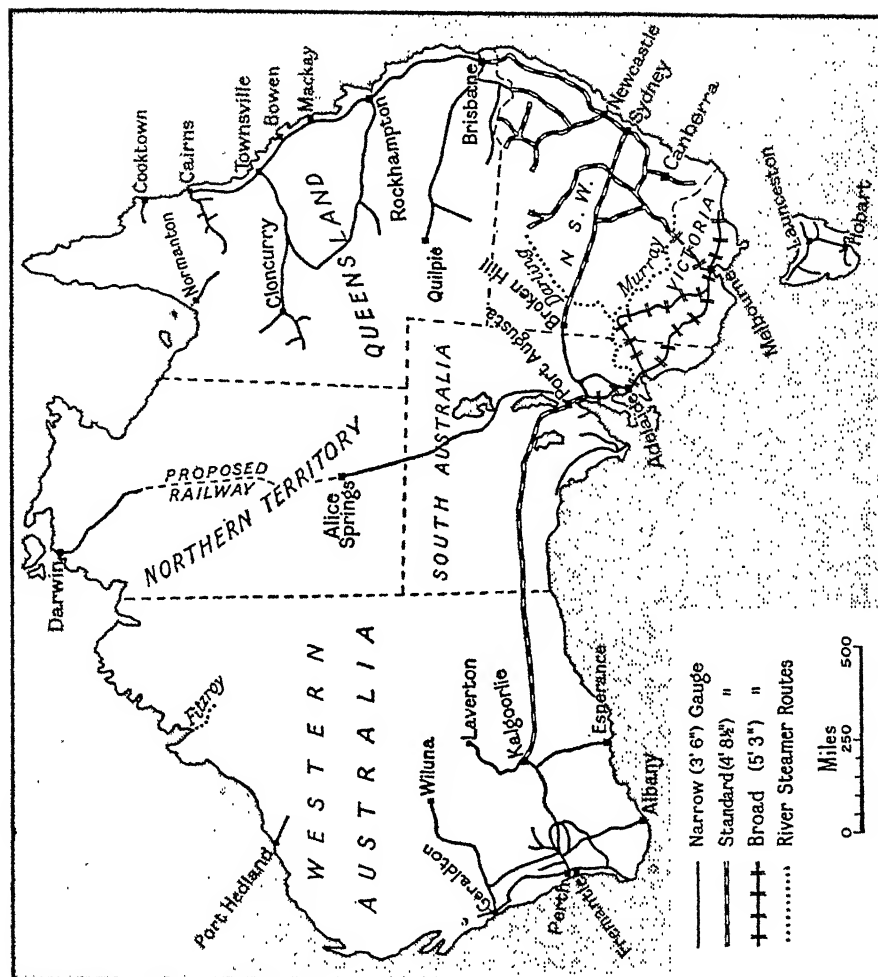
Even to the west of the Barrier Reef the navigation of **Torres Strait** has been made difficult by the coral-builders. The hundred miles of sea between Cape York and the south coast of New Guinea, besides being studded with numerous small islands, is crowded with coral reefs and sandbanks, which leave only one or two safe channels for shipping between them. The channel most used is that which lies immediately north of the Prince of Wales group of islands, on one of which, named Thursday Island, there is a much-frequented calling station for shipping.

The **surface** of Australia is for the most part fairly level, consisting of either plains or plateaus of great extent. In the east, however, a continuous range of highlands runs at no great distance from the coast from north to south, and then bends with the coast westwards, terminating in the south-east of the state of South Australia. The general name of Dividing Range is given to the whole of this series, since it separates the low-lying coast valleys and small plains from the broad plains of the interior. In the south-east, where the Dividing Range attains its highest elevation (with peaks above 7,000 feet in height), it forms a regular mountain chain known by the name of the Australian Alps. The flat-topped ranges in New South Wales, to the west of Sydney, are known as the Blue Mountains.

The Dividing Range was long the chief obstacle in the establishment of **railway communication** with the interior—an obstacle which was overcome in some places, especially in New South Wales, only by great engineering skill. The map opposite shows that there is no railway connection of the coast with the interior between Melbourne and Sydney, and a careful study of physical maps shows that this is a natural consequence of the superficial configuration, which is thus disadvantageous for both the states to which these ports belong, but at the same time favourable to the ports themselves, as concentrating upon each a greater amount of traffic than would otherwise have fallen to them.

The plateau in the east of Australia attains at its widest a breadth of rather more than one hundred miles, and gradually sinks on the west to the low level plains, which occupy the greater part of the middle of Australia. The western half of the island consists mainly of a great plateau about 1,000 feet in height.

The series of highlands above described is appropriately called the **Dividing Range**, not only on account of the contrast presented



AUSTRALIA

PRINCIPAL RAILWAYS AND NAVIGABLE WATERWAYS

A great drawback to railway transport in Australia is the lack of uniformity in gauge, a defect which has engaged the earnest attention of successive Federal Governments and is becoming more serious every year as the inter-state traffic increases.

The adjoining map distinguishes between the three gauges on which lines have been built in the Commonwealth. Unification has been officially accepted in principle, and until this can be achieved the policy has been to make a number of through connections on the standard gauge.

by the surface on different sides of it, but also because of the influence which it has upon the **climate**. The chief rain-bearing winds of Australia blow more or less from the east, since the island lies mostly in latitudes in which the south-east trade wind prevails, and the causes which give rise to that wind have a great effect on the direction of the air-currents even on the land. Hence, in the western half of the island the prevailing tendency of the winds is seawards. The period of the year in which this tendency is mostly overpowered is the summer, when the excessive heat of the interior brings about great rarefaction of the air, but at the same time tends to prevent much of the vapour brought from the sea from being condensed into rain. The extreme north of Australia, being within 12° of the equator, has conditions of heat and moisture approaching the equatorial. As to the climate of the extreme south-west see p. 40. The highlands on the east, however, have their usual effect on sea-borne vapours, and their eastern slopes are copiously watered at all seasons of the year, but in the tropical and sub-tropical latitudes chiefly in summer. The interior plains and plateaus, on the other hand, receive less and less rain the farther they are distant from the sea, and almost all parts which are more than two hundred miles from the coast receive much less rain in the course of the year than the driest parts of England. This rain, too, falls in latitudes in which the heat and consequent evaporation are greater than in the British Isles, so that in summer the ground is everywhere parched and cracked, and the grass withered, and none but winter crops can be grown, even where the rainfall is sufficient to grow crops at all. And even if the average rainfall is adequate for the crops usually grown and for the wants of the livestock reared, it is in many parts very precarious, years of flood alternating with years of drought, leading to great variations in the yield of the crops and the number of sheep and cattle that can be reared in a given area.

Between the northern part of Australia which lies within the tropics, and the southern part, from 10 to 15 degrees beyond the tropics, there are of course great differences in the temperature; but in all parts of Australia there is in the low grounds no winter of snow and frost to interrupt the labours of the field or to make it necessary to provide shelter for horses and cattle.

The nature of the climate of Australia explains that of the Australian **rivers**. Most of those which enter the sea on the east and south-east of the Dividing Range are comparatively short, but are generally well supplied with water all the year round. They vary greatly in their depth according as the weather is dry or rainy, and they are in many cases apt to overflow their banks. Many of them are navigable for a shorter or longer distance; but they bring down so much sediment from the neighbouring highlands in which they take their rise, or from which they derive their feeders, that bars

are formed in many cases at their mouths, and the entrance of large vessels is thus prevented or impeded.

All the great rivers of Australia take their rise on the inner slopes of the tableland, and flow towards the west or south-west. Only one of these, the Murray, enters the sea by an independent mouth. Before entering the sea this river turns nearly due south and flows through a large shallow sheet of water called Lake Alexandrina, which communicates on the south with Lake Albert, and a long shallow lagoon known as the Coorong, separated from the sea by a broad line of sand-dunes. The longest tributaries of the Murray are those which it receives on its right bank, the Murrumbidgee and the Darling, the former of which receives on the right another great tributary, the Lachlan. These rivers might all be ranked among the great rivers of the world if we considered only their length (the Murray and the Darling being both much more than 1,000 miles long), but the climate of the region through which they flow causes them to be very scantily supplied with water. The Darling even dries up in summer in many parts of its course into a chain of small lakes.

Nevertheless all these rivers are navigable by steamers of shallow draught for a long distance into the interior. In ordinary circumstances the Murray can be ascended to Albury, 1,700 miles up, where the river is crossed by the railway from Melbourne to Sydney. Unfortunately, however, this river navigation cannot be continued into the sea. The line of sand-dunes which separates the Coorong from the sea is continued in the form of a bar across the mouth of the Murray, where it leaves Lake Alexandrina, so that goods must be laid down or taken up at some point in the course of the river and carried the rest of the distance by land. Under the Murray Waters Agreement which came into force in 1916 works were undertaken involving the construction of twenty-six locks on the Murray and nine on the Murrumbidgee, with a view to improving the navigation and increasing the facilities for irrigation. The Hume Reservoir and Lake Victoria storage are part of the scheme. Apart from providing permanent navigation for river vessels for 1,250 miles, the total area irrigated is 1.4m. acres (2,000 square miles—an area as large as Norfolk).

On the other long rivers which are to be seen on maps traversing the plains in the interior of Australia, the greater number are hardly rivers at all in the proper sense of the term. They are merely watercourses which may be filled at times with running water, but which are often empty except for a few days in the year. Many of them after a longer or shorter course dry up and disappear, their water having all sunk down into the porous sand which forms their bed, or evaporated under the heat of the sun. The most important of the streams that end in this way is the Diamantina, which enters

South Australia from the south-west of Queensland. Others empty themselves into large shallow lakes, which in summer shrink greatly in dimensions. There are several such salt lakes in the lower parts of Australia, the chief being Lake Torrens and Lake Eyre, into the latter of which flows at certain seasons the Barcoo river, or Cooper's Creek, the longest of these feeders of inland lakes. In the dry period of the year this river in its lowest part creeps on more and more slowly, and in the end dries up like the Diamantina, though the course which it follows in times of flood, when it swells to a breadth of two miles and increases in depth to twenty feet, can still be distinguished by the grass and trees by which it is bordered.

The use of the few great rivers of the south-eastern Australian plains as navigable highways and for the watering of flocks has long been known, and the gradual slope of the plains over which they flow admits of many large tracts being irrigated by their means. The irrigated areas are mainly in the Murray Basin. In New South Wales, Victoria, and South Australia a valuable source of water is from the famous artesian basins—especially the Great Basin and the Murray River Basin. The former is pierced by many thousand bores, in Queensland, New South Wales, and South Australia. The water is excellent for stock but owing to a considerable proportion of salts cannot be used for irrigation.

Vegetation. On the tableland and plains of the interior the Australian 'bush' is open and easily traversed either by a horseman or even by motors, and between the trees or bushes leaves plenty of space for grass and herbage on which sheep may be pastured. The forests which clothe the wetter margins become thinner and thinner the scantier the rainfall. In many of the more arid parts large stretches of ground are occupied by dense masses of low bushes difficult to penetrate and difficult to destroy, these patches being well known as 'scrub'; and in more arid regions still the bushes forming the scrub are often armed with strong sharp spines, which tear the clothes and the flesh of those who try to force their way through. Even some of the grasses, notably the well-known spinifex, have sharp-pointed leaves. In tussocks this grass covers by itself vast areas in the deserts of the west. Most of the native grasses of Australia are nutritious, and among these the tall kangaroo grass is notable for its power of withstanding long drought. And even where the climate is so dry that grasses do not thrive, there are certain herbs which will still thrive and yield food for sheep and cattle. The most valuable of all these is the salt-bush, an ugly grey shrub about two feet high, which, as its name indicates, flourishes on a saline soil, such as is apt to be found where rain is scarce and evaporation great, but which is all the better for sheep on that account, since the sheep that are fed on a saline herbage are reported

to furnish the finest wool, and are free from certain diseases to which they are liable in other districts. Owing to the variations in rainfall there is thus usually a ring of forest round the continent which gives place to open forest, bush, and scrub and finally to semi-desert and desert in the dry heart of the continent. There is not the difference one would expect between the tropical and temperate parts of the continent owing to the highly peculiar character of both flora and fauna. The most typical trees are the eucalyptus or gum trees and species of acacia, whilst the typical animals are the marsupials, notably the kangaroo. The danger of upsetting the 'balance of nature' by introducing wild or semi-wild plants and animals into a country where they are free from hereditary enemies is well seen in the case of the prickly pear (which has overrun thousands of acres) and the rabbit.

People. The aboriginal Australians belong to a very old type of humanity (allied to the fossil neanderthal man of Europe), are few in numbers, and appear to be fast dying out. The level of their material culture is low though their social organisation is complex. They were never numerous, perhaps 150,000 when Cook landed, and their total number is estimated now at about 60,000. The majority live in the north and west, as do also the 20,000 half-castes. The first inhabitants sent from the British Isles to Australia were convicts, and the first ship containing convicts sailed in 1787, and arrived at Botany Bay, in New South Wales, early in 1788. Soon free settlers began to arrive. These were mainly from the British Isles, but there were also many Germans. Chinese (these nearly all men) and Polynesians were introduced into Queensland as labourers on the tropical plantations, but under the legislation of the Commonwealth not only is the introduction of all coloured labour prohibited, but even that of white labourers under contract, unless it can be shown that the labour which these supply is of a kind that cannot be obtained in the Commonwealth. Under the Pacific Island Labourers' Act no Pacific Islanders were allowed to enter Australia after March 31, 1904, or were to be allowed to remain there after the end of 1906. However, the bulk of the immigrants throughout Australian history have been free British citizens attracted by the possibilities of a great new land. At the present day aliens constitute an almost negligible percentage of Australia's 9m. people. The 'White Australia' policy is still firmly adhered to, although some have grave doubts whether tropical Australia can ever be adequately developed without the help of coloured labour.

A comparison between Australia and South Africa. An interesting comparison may be made between Australia and South Africa so far as they correspond in latitude, both in respect of resemblances and differences. The northernmost latitude of Australia corres-

ponds to that of the mouth of the Rovuma in South Africa, but Australia (excluding Tasmania) extends, in the south-east, four degrees beyond South Africa. These areas both lie between two oceans, and are so far similar in structure that they both have ranges of mountains running parallel to the east coast and then turning west to face the south coast and have a large extent of high plains in the interior; but they differ in that the eastern mountains are much higher in Africa than in Australia, in that the southern mountains are found only in the east of Australia, but extend along nearly the whole width of South Africa with terraces intervening between the mountains proper and the sea, in that the higher plains of Africa are towards the east, those of Australia (mostly much lower) towards the west, and that in Australia a broad belt of low plains intervenes between the higher elevations of the west and east. There is the further notable difference that Australia is an island, South Africa only part of a much larger continent. This latter difference probably contributes, along with the higher altitudes of the African mountains, to explain the somewhat striking contrasts in the seasonal distribution of the rainfall between places in corresponding latitudes on the eastern side, which in both is that which has on the whole the most abundant rainfall.

The proportion of winter rains in South Africa is small compared with that at the corresponding Australian stations. The higher winter rainfall in Australia is no doubt largely due to the fact that situation and structure leave the east side of that continent open to vapour-bearing winds both from the north and south; and this again will go far to account for the fact that the pasturage of Australia is more succulent and freer from injurious thorny and prickly vegetation than that of South Africa, and that the Australian continent on the east side has much larger areas suited for wheat than the same side of Africa. In the areas of Mediterranean climate Perth is 2° farther north than Cape Town, a latitude at which on the west side of South Africa the rainfall of the year is quite negligible, which explains why in this part also Australia has a much greater area suited to wheat than South Africa. In temperature, it should be noted, there is little difference between the corresponding stations in spite of differences in altitude. Another very important difference resulting from Australia being an island is that there is no such native question there as forms such a serious problem in South Africa, that in Australia the white man can and does work with his hands without the sense of lost dignity.

The **Australian Commonwealth** was constituted under an Act of the United Kingdom Parliament passed in 1900, and was proclaimed at Sydney on January 1, 1901. The six former colonies of Victoria, New South Wales, Queensland, South Australia, Tasmania, and Western Australia formed the six original states of

this Commonwealth. The legislative powers of the Commonwealth Parliament include taxation, currency and coinage, bills of exchange and promissory notes, bankruptcy and insolvency, insurance and banking (other than state), copyrights, trade marks and patents, immigration and emigration, naturalisation, the influx of criminals, invalid and old age pensions, marriage, divorce, and matrimonial causes, foreign corporations, external affairs, external and interstate trade and commerce (but so as not to affect the freedom of interstate trade, commerce and intercourse), postal and similar services, naval and military defence, public borrowing, and other incidental matters.

The site of the permanent capital, to which the name of Canberra was given on March 12, 1913, on the occasion of the initiation of the operations for laying out the city, is an area at the height of from about 1,800 to upwards of 2,000 feet above the sea, lying in a piece of territory in the south-east of New South Wales, by which the territory was ceded to the Commonwealth on January 1, 1911. It has already been connected by rail with the New South Wales railway system, and a railway is also to be laid connecting it with Jervis Bay, where other land has been ceded to the Commonwealth for the formation of a commercial port and naval station. The government departments were gradually removed to Canberra from Melbourne, which was the temporary seat of the general government. The Parliament Houses were opened in 1927 by the Duke of York, later King George VI.

Animal products. The native land mammals, nearly all of which belong to the same peculiar group as the kangaroo (marsupials), yield furs of comparatively small value in the aggregate, and from a commercial point of view destroy a great deal more than they produce. The same is true of the dingo, or native dog, the only large native mammal that is not a marsupial. The most valuable of the introduced animals is the sheep, wool holding normally the first place in value among the objects of production in the Commonwealth. The wool production of Australia in general is treated of elsewhere (see p. 156), but here it may be added that no part of the world has shown itself better suited for the production of fine (merino) wool (see p. 154) than the treeless grassy plains with a saline soil bordering the Murray river and its tributaries in Victoria and New South Wales. As to frozen mutton and beef see p. 240, and as to rabbits see p. 239. A later development is the export of *chilled* beef. Of recent decades there has been a steady growth in dairying, with a corresponding development in the export of butter and cheese, bacon and eggs.

Cultivated crops. In the states of the mainland in which, as is shown in the last column of the table overleaf, there was the greatest extent of land under cultivation, wheat is the chief crop.

States and Territories of the Commonwealth.	Area in thousands of square miles.	Ratio to Great Britain.	Population in thousands.					Population per square mile.	Millions, 1951-52.		
			1871.	1901.	1921.	1936.	1951.		Sheep.	Cattle.	Acreage of crops.
Victoria . . .	88	1	732	1,208	1,532	1,843	2,291	26.1	21.5	2.2	4.3
New South Wales . . .	309	3½	504	1,360	2,100	2,656	3,359	10.9	53.7	3.6	4.7
Queensland . . .	671	7½	120	503	756	972	1,220	1.8	16.2	6.4	2.0
South Australia . . .	380	4½	186	366	495	586	730	1.9	11.5	0.4	3.6
Western Australia . . .	976	11	25	195	332	447	592	0.6	12.2	0.9	4.5
Tasmania . . .	26	½	102	173	214	230	307	11.7	2.3	0.3	0.4
Northern Territory . . .	524	6	—	—	4	5	16	0.03	0.03	1.1	—
Federal Capital Territory . . .	1	—	—	—	2.5	9	25	26.7	0.2	0.01	—
Commonwealth . . .	2,975	33	1,669	3,805	5,435	6,750	8,539	2.9	117.6	14.9	19.5
Papua . . .	91	1	—	—	—	275 ¹	373 ²	4.1 ²	—	—	—
New Guinea . . .	93	1	—	—	—	265 ¹	1,103	11.9	—	—	0.2
New Zealand . . .	105	1½	256	816	1,320	1,466 ¹	1,985	19.1	34.8	5.1	1.9 ³

1933.

1950.

1 Area under field crops 1949-50.

Till the end of last century South Australia was the chief wheat-growing part of Australia, but the movement for closer settlement has brought about a great increase in wheat cultivation in all the states extending into higher latitudes, and even before the First World War New South Wales had come to have the greatest area under this crop though not the highest production. The area under wheat in the Commonwealth increased from 9·3m. acres in 1913-14 to 12·5m. in 1915-16, but afterwards greatly declined. The lowest figure of recent years was reached in 1919-20 (6·4m.) since when there has been a steady recovery, the average acreage now being about 15 and the production 180m. bushels (5m. metric tons). New South Wales (a quarter to a third of the whole) leads in acreage and production. Oats, barley, and maize though important occupy but a fraction of the wheat acreage, but hay (for dairy cattle) covers a ninth of all the cultivated land.

The vine receives most attention in Victoria and South Australia. Sugar-cane is cultivated in Queensland and a variety has been found to succeed far beyond the tropics, and is grown even in the north-eastern valleys of New South Wales. The fruit-growing industry of the Commonwealth is now very important especially for apples in the cooler parts of Victoria and Tasmania, oranges in the warmer lands of Western Australia, South Australia, and the Murray basin. Large numbers of Australians served in the Second World War and in the resettlement which took place after that war there was a marked move to the towns. Despite improved mobility by car and plane and the invaluable source of contact by wireless, life in the back blocks is not popular. There is a disturbing tendency for agricultural land to decrease in area and production to fall.

The **mineral wealth** of the states already commercially available is enormous. Hitherto by far the most important of the mineral treasures has been gold. It has been found more or less in all of them, but most abundantly in the three eastern states and Western Australia. Victoria stands first in respect of the amount of gold produced, having raised gold since its first discovery in the colony, in 1851, to the value of £350m., or nearly half the total for the Commonwealth (£750m.). But with regard to this metal it is important to bear in mind that, on account of its great value, it is so eagerly searched for in districts known to be rich in it, that (in the case of alluvial gold) the amount yielded by any district soon begins to diminish. Hence the prosperity which a gold-field brings to a district is often only a passing prosperity. While the aggregate value of Australian wool increased fairly steadily till after 1890, that of gold soon reached its highest value and began to decline. After the early big production of the years between 1851 and 1860, there was a steady decline in the value of the gold won until the decade 1881-90. The next decade witnessed the remarkable series

of discoveries in Western Australia, and that state in 1898 assumed her present leading position in production. The peak of Australia's production was reached in 1903, after which there was a continuous and somewhat rapid decline until 1930. The increased value of gold in terms of Australian currency led to a great resuscitation of mining in the years from 1931 onwards. The other minerals of commercial importance include copper in Queensland, Tasmania, South Australia and New South Wales; tin in all the eastern states and Tasmania; silver, lead, and zinc in New South Wales (Broken Hill District); silver and lead also in Queensland and Tasmania; wolfram in Queensland; and uranium. Ores of iron are in large quantity in almost all the states, and some of the most important deposits are now utilised under government encouragement in the development of iron and steel industries. Of these the most important is the Iron Knob, a hill of iron ore, containing a high percentage of iron, situated about 40 miles W.S.W. of Port Augusta (South Australia) and smelted and worked up into iron and steel products at Newcastle (New South Wales). Magnet Mountain is another South Australian deposit. Coal, mainly from New South Wales, is now by far the most valuable mineral product of Australia. The annual output is now between 10m. and 20m. tons. By far the most important field is that of New South Wales—the largest coal basin in the Southern Hemisphere. The field is at present worked mainly near the outcrops—in the north at Newcastle, in the west at Lithgow, in the south at Illawarra. There is a large field in the Dawson River Basin of Queensland and other smaller fields. Brown coal is specially important in Victoria where the Morwell deposits are worked at Yallourn and electricity is generated to supply Melbourne. An oil strike in 1953 at Exmouth Gulf, Western Australia, may be important. Australia is famed for opals.

Commerce. On this matter the tables given below may be allowed very largely to speak for themselves. The marked advance in the trade of Australia with foreign countries as compared with a stationary or declining proportion of the trade carried on with the United Kingdom since the period 1881–85 is not to be wondered at, when it is considered that it is mainly since the beginning of that period that direct trade has been opened up with foreign countries. Direct trade with Germany began in 1879, with Belgium in 1881, with France in 1883. From 1887 till the eve of the First World War the North German Lloyd ran regular steamers to Australia; and from 1888 a line of German cargo-boats connected the chief Australian wool ports with Antwerp, Hamburg, and Dunkerque. A regular service is maintained between San Francisco and the Commonwealth, and Norwegian vessels take an important part in the trade. The last of the regular sailing vessels, so long famous in the Australian trade, ceased to operate only in 1951.

Throughout Australia there are uniform customs duties but trade between the states is free. In the last fifty years various efforts have been made to encourage inter-Imperial trade. A reciprocal customs tariff was in operation between Australia and South Africa from 1906 to 1926; similar agreements have been

AUSTRALIA

GENERAL IMPORTS (INCLUDING BULLION AND SPECIE)

	Percentages of Total Value.							
	'04-'05	'06-'10	'11-'13	1924.	1926-30.	1931-35.	1938-39.	1951-52.
<i>Raw materials:</i>								
Petroleum . . .	—	—	—	3.6	6.0	8.4	7.1	7.5
Wood . . .	3.0	3.7	4.2	3.8	3.0	1.7	2.1	2.7
Paper & manfs. . .	2.6	2.5	2.5	4.5	5.3	7.2	4.3	5.2
Tobacco . . .	—	—	—	2.0	1.8	1.6	1.9	1.8
<i>Foods:</i>								
Tea . . .	2.1	2.1	1.7	2.4	2.7	3.1	2.5	1.1
<i>Manufactures:</i>								
Machinery . . .	5.9	5.8	6.0	8.4	10.3	7.8	13.8	12.0
Cars . . .	0.3	0.8	2.1	8.6	6.8	3.2	7.5	9.2
Iron and steel . .	6.1	8.0	9.1	2.8	3.3	2.6	3.3	7.0
Other metals and manufactures	—	—	—	8.6	7.4	5.8	20.5	9.2
Silk or synthetic silk goods . . .	8.0	7.5	6.3	19.5	4.0	5.2	2.6	2.6
Cotton goods . . .					3.5	8.5	4.5	6.3
Yarn and cordage . .					4.0	6.0	1.2	1.6
Bags and sacks . . .	—	—	—	1.9	3.3	5.7	5.6	2.8
Chemicals . . .	1.8	1.5	1.2	2.8				
Total £A. million ¹	37.7	51.5	75.0	140.6	147.6	58.3	99.9	1,053.4
<i>Countries:</i>								
United Kingdom . .	53.0	51.0	50.3	45.2	41.7	41.1	40.5	44.2
United States . . .	13.1	12.6	13.7	24.6	24.2	31.5	14.7	10.4
Indonesia ² . . .	0.8	1.0	1.2	3.3	4.3	6.2	7.1	2.4
India . . .	3.7	4.0	3.4	3.4	4.1	5.7	2.9	4.5
Japan . . .	1.0	1.2	1.2	2.5	3.1	5.6	4.1	4.2
Germany . . .	7.9	8.8	9.1	1.0	2.8	3.2	4.1	3.1
Canada . . .	1.0	1.1	1.2	3.6	2.7	4.1	7.7	2.2
France . . .	3.5	3.4	3.0	2.9	2.5	2.0	1.0	2.1
New Zealand . . .	5.9	4.6	3.6	1.7	—	—	2.2	0.7

¹ Values in Australian pounds, which were formerly equivalent to sterling. From 1935 £1 sterling = £A.1.25.

² Dutch East Indies till after Second World War.

in force with New Zealand, Canada, and other parts of the Commonwealth. There has been a preferential tariff in favour of the United Kingdom since 1907; the Customs Tariff Act, 1933, gave effect to the 'Ottawa Agreement' of the preceding year increasing the preference.

All the states, and even the ports of the north-west coast of Western Australia, are now in regular steam communication with Europe. Different routes are followed, but most of the ships pass through the Suez Canal and along the south coast of Australia. Since 1872 Australia has been connected by telegraph with the

AUSTRALIA
GENERAL EXPORTS (INCLUDING BULLION AND SPECIE)

	Percentages of Total Value.							
	'04-'05	'06-'10	'11-'13	1924.	1926-30.	1931-35.	1938-39.	1951-52.
<i>Raw materials:</i>								
Wool	32.3	37.1	33.2	50.0	42.4	39.8	30.4	47.9
Hides and skins	3.0	4.3	5.5	4.8	4.7	3.3	2.9	2.5
Lead	1.5	1.6	1.9	3.0	2.7	2.5	3.1	3.8
<i>Foods:</i>								
Wheat	8.3	8.5	10.1	12.4	12.3	15.1	6.2	8.3
Wheat flour	—	—	—	4.7	4.2	4.0	3.2	4.9
Butter	4.2	4.3	4.9	4.4	5.0	9.2	9.2	0.8
Meat	2.9	3.7	5.4	2.3	3.6	6.9	8.4	5.3
Mutton & lamb	—	—	—	1.0	1.5	3.2	3.4	0.3
Beef	—	—	—	1.2	1.8	2.2	3.1	1.8
Sugar	—	—	—	—	2.7	2.1	3.0	1.0
Fruits	—	—	—	—	2.3	4.3	4.5	2.9
<i>Bullion and coin</i>	27.6	17.4	12.8	53.0	7.7	—	13.5	1.4
<i>Total £ A. million</i>	—	—	—	112.4	138.0	95.9	140.5	675
<i>Countries:</i>								
United Kingdom ¹	47.5	47.6	42.8	38.1	41.1	48.9	48.9	30.8
France	8.4	9.8	10.9	12.5	10.8	5.7	6.7	8.6
Japan	1.0	1.7	1.4	9.7	7.5	9.7	3.5	7.2
Germany	6.6	9.2	8.8	3.7	6.4	5.0	1.9	3.0
Belgium	4.8	7.2	8.5	5.5	5.4	4.9	4.0	3.7
United States	2.9	3.8	2.6	6.0	5.8	2.3	13.9	11.4
Italy	—	—	—	3.9	3.2	3.2	0.9	5.6
New Zealand	2.7	3.4	3.1	4.2	2.9	2.9	4.8	5.5
India	5.5	3.3	3.2	—	—	—	1.4	2.5
Ceylon	9.6	3.2	6.0	—	—	—	0.9	1.6

¹ See footnote to table on p. 849.

rest of the world through the completion of the overland line which crosses the state of South Australia and the Northern Territory between Adelaide and Port Darwin and is there connected with a line which passes under the sea to the island of Java. The cable from Vancouver to Queensland and New Zealand by Fanning, Fiji, and Norfolk Islands was completed in November 1902. The first wireless station was erected in 1905 for demonstration purposes, and the first official stations opened for business in 1912. Direct beam wireless service with London was established in 1927 and with North America in 1928. International wireless telephone communi-

cation is now possible with 93 per cent. of the world's telephone subscribers (probably 100m. telephones).

Very extensive use is made of air routes in Australia. Many country doctors visit outlying settlers by plane; regular services for mail and passengers link centres not accessible by railway, and the 'major' subsidised services include Brisbane-Darwin-Singapore (connecting with B.O.A.C. to London), Cloncurry-Normanton, Perth-Daly Waters (*via* the north-west coast towns), Cootamundra-Charleville, Melbourne-Hobart, Perth-Adelaide. There are many minor lines.

Victoria is the smallest of the states on the mainland of Australia. It occupies the extreme south-east, and is separated from the state of New South Wales mainly by the Murray river. The first permanent settlement on its territory was made towards the close of 1834. Till 1851 it was a dependency of New South Wales. A large part of the surface is mountainous. The Australian Alps, with their spurs, fill the greater part of the eastern half of the state. West of these mountains the Dividing Range sinks in elevation, so that easy routes could be found for the railways laid north of Melbourne such as through the Kilmore Gap to the plains on the other side. The plains to the south of the Dividing Range (the Great Valley of Victoria), lying as they do on the moister side of the mountains, are well watered, in many places thickly covered with trees, and clothed with rich grasses, more suited for horses and cattle than for sheep. This is especially the character of Gippsland, the region to the south of the Australian Alps and where, south of the plains, rise the Gippsland Hills. This has become important dairying country. In the north there is greater dearth of rain; nevertheless, it is in this part of the state that the area under crops, especially wheat, has been greatly extended, since the decline of the gold-fields caused so many people formerly engaged in mining to take to farming. In some years the rainfall even here is sufficient to allow of abundant crops being grown, but when the rains fail great loss follows to the cultivators. Hence, if farming is to be carried on regularly with success in this region, it can only be by irrigation, to which great attention is given by the government. All the streams are vested in the state, which has constructed storage works for irrigation on all the more important of them. In the north-west is the district called Wimmera, formerly in the main a waterless desert, but containing a tract with an excellent soil bordering the Murray, on which large irrigation works have been carried out at Mildura and elsewhere. Among the objects of cultivation are grapes, including the raisin and currant grapes; oranges, figs, apricots, and peaches; plums, including plums for prunes; besides sorghums, tobacco, fibre-plants, and other crops. Farther south large areas of the plains have been reclaimed for

wheat cultivation by clearing them of what is known as the mallee scrub, that is, thickets of the *Eucalyptus dumosa*, brittle-stemmed trees growing to the height of from 12 to 20 feet; but the yield of the crops, like the rainfall, is apt to be somewhat precarious. Sugar-beet is also cultivated in Victoria at Morwell, 80 miles from Melbourne as mentioned above. Brown coal is being mined in rapidly increasing quantity.

The capital and chief seaport is Melbourne, situated on the Yarra, a short distance above its mouth in Port Phillip Bay. The Yarra is navigable up to the city by vessels of considerable size, including all those engaged solely in the coastal trade; but the harbour of Melbourne for the largest ocean steamers is formed by Hobson's Bay, the upper part of Port Phillip. On this bay stand Port Melbourne (formerly Sandridge) and Williamstown. Port Phillip itself is a shallow sheet of water, which affords a large extent of safe anchorage, but has a narrow and difficult entrance. On a western arm of this bay stands the port of Geelong, a town that has long carried on the manufacture of woollen tweeds, &c., which are supplied to all the Australian states. In the interior, north-west of Melbourne, is Ballarat, the centre of the richest alluvial gold-field ever opened up, but which is now to a large extent exhausted, gold being now mainly obtained not by digging but by the crushing of quartz-rock. In a more northerly direction from Melbourne lies Bendigo (Sandhurst), the chief centre of quartz-crushing. On the Murray, Wodonga, opposite the New South Wales town of Albury, is at the head of the ordinary navigation, where the river is crossed by the railway to Sydney; lower down is Echuca, at the place where the river makes a sharp bend to the north-west, and where another railway crosses into New South Wales, and near which extensive tracts are irrigated from the Goulburn Weir and Loddon river works.

New South Wales was so called by Captain Cook, who was reminded of the Wales of Great Britain by the appearance of the mountains which he saw from off the coast. It was in this state that the first permanent settlement was founded in Australia, namely, on the magnificent natural harbour of Port Jackson, the harbour of Sydney, which has few rivals in the world for either beauty or convenience. Throughout the state the Dividing Range forms a more continuous barrier between the coast lowlands and the interior plains and tablelands than it does in Victoria, and it was long before the settlers found a way across the Blue Mountains, as the part of the Dividing Range behind Sydney is called. The route at last found in this quarter is now traversed by a railway, which finally pierces the mountains in a tunnel 3,700 feet above sea-level. Formerly the line descended on the west side in numerous zigzags, but these were avoided by the opening of an easier route in 1910, and three years

later similar improvements were made on the east side, reducing considerably the cost of working the traffic. Further north the New England Range, trending north and south (crossed by rail, on Ben Lomond, at a height of 4,473 feet), and the Liverpool Range, trending east and west, shut off the part of the tableland known as the Liverpool Plains, which contain the headwaters of the Namoi, or Peel river, one of the tributaries of the Darling. It is in New South Wales that the steepest railway gradients in Australia occur. The interior of New South Wales generally is traversed by the chief tributaries of the Murray, and the treeless plains noted for their wool lying to the north of that river are hence known as the Riverina. The population of New South Wales increased at a much more rapid rate than that of Victoria, which it now exceeds by about a million. It is, however, much more widely distributed over the surface, so that there is no part of New South Wales where the railways are so thickly crowded together as they are in part of Victoria. The reason of this is that the mineral treasures of the state are more widely distributed, and the population engaged in agriculture is similarly scattered over the large area of the interior plains where wheat and sheep farming are possible. Some of the coast strip is rather sterile, but south of Sydney is much dairying, and northwards, along the line of the Brisbane to Sydney coast railway, are lands wet enough and warm enough for sugar-cane and there is much dairy farming.

Lord Howe Island lying to the north-east of Sydney is a dependency of New South Wales. Norfolk Island, nearer New Zealand, is administered by the Commonwealth. They both contain a small number of inhabitants, grow fruits, and are popular tourist resorts. Production of Kentia Palm seeds is, however, the chief industry of Lord Howe Island.

The capital of the state and chief seaport of New South Wales is Sydney, on Port Jackson. With a population of 1½m. Sydney has almost half the population of the state. The residential suburbs are scattered round the shores of the harbour, and Sydney has been linked since 1932 with North Sydney across an arm of the harbour by the largest single-arch bridge in the world, costing over £10m. At the head of the so-called Parramatta river, which is in reality a prolongation of the inlet of Port Jackson, stands Parramatta, in a district noted for its oranges. North of Sydney, on the estuary of the Hunter river, stands Newcastle, the chief coal-mining town and place of export of coal. The coal is now exported not only to all the other Australian states, but also to foreign countries. Newcastle is the centre of important manufacturing industries—iron, steel, and engineering. Another important coal-port is Wollongong, to the south of Sydney, the port of the Illawarra coal-field. In this district Port Kembla is rapidly developing into a leading manufac-

turing city—with iron, steel, and metal refining works. Bathurst, on the tableland behind Sydney, is the centre of the chief wheat-growing district of the state; Deniliquin, that of the pastures of the Riverina, and the starting-place of the railway by which the wool of that district is dispatched for export to Melbourne (not to Sydney); Broken Hill and Silverton, near the western frontier, are the chief towns of the Barrier Range, a silver-lead-zinc yielding area, amongst the richest in the world. The water-supply of the silver-mining district was at first a difficulty, but is now obtained from local rivers. Most of the ore is conveyed to Port Pirie in South Australia, for smelting purposes, though the district is now accessible by rail from Sydney. A portion of the zinc concentrates produced is treated at Risdon, Tasmania, and the balance exported overseas.

Queensland, the state to the north of New South Wales, was once, like Victoria, a dependency of New South Wales, from which it was separated in 1859. It includes all the islands in the narrowest part of Torres Strait. The surface consists mainly of land above 1,000 feet in height, and the district in the south-east known as the Darling Downs, on which are the finest pasture grasses in the state, is about 2,000 feet high, and thus has a comparatively cool climate for its situation, within five degrees of the Tropic of Capricorn. Extending far into the tropics, Queensland has more varied products than the more southern states. Among the tropical and sub-tropical products are cotton, bananas, pineapples, and melons, but at present the chief is sugar-cane, which is largely grown in the low river valleys on the coast. The yield of unginned cotton increased from 27,000 lb. in 1919 to 16m. lb. in 1925 and, despite fluctuations, reached 27m. lb. in 1934; but in later years it declined rapidly, and is now of little account. The output of raw sugar is over 600,000 tons. In the warmer, wetter parts of Queensland maize is the chief grain, wheat on the cooler lands.

Queensland is the most important cattle-raising state in the Commonwealth, having vast areas of some of the finest grazing lands in the world, with ample room for expansion in the production of chilled and frozen beef for export purposes. The wool industry is the most valuable of all the state's activities, practically the whole output being of fine merino wools. The state had, in 1936, 18,060,000 sheep and 6,033,000 cattle; in 1952 the totals were 16m. and 6.4m.

Gold is found in many places, but most abundantly at Mount Morgan. Other famous fields include Charters Towers and Gympie. Tin is found in several widely separated districts. One of these is on the tableland in the extreme south of the state, in a district adjoining the New South Wales tin-field, the centre of this district being Stanthorpe. Another, which is the more productive, is round Heberton, near the east coast, in about $17\frac{1}{2}^{\circ}$ S. lat. A very rich copper district lies round Cloncurry, in the north-west of the state,

to the south of the Gulf of Carpentaria, and in January 1908 this was connected by rail with Townsville. Another rich copper-field is Chillagoe. More than 2m. ozs. of silver and 42,000 tons of lead were produced at Mount Isa in 1934. Besides metals, Queensland is very rich in coal, but it has not, like New South Wales, a coal-field accessible to ocean-going vessels. The chief collieries are in the basin of the Brisbane and Bremer rivers, others are those of Wide Bay and Maryborough, Darling Downs, Rockhampton, and Bowen districts.

The capital of the state is Brisbane, 500 miles north of Sydney, situated on both sides of the Brisbane river, at the head of navigation for large sea-going vessels. Toowoomba, on the tableland to the west of Brisbane, is the chief town on the Darling Downs. Rockhampton, close to the Tropic of Capricorn, at the head of navigation of the Fitzroy river, is the second town in population in the state and the outlet for a rich and extensive pastoral district as well as for districts producing gold and copper. Townsville is the outlet for several large mining fields, including that of Cloncurry, and also for a large area of pastoral country, so that it has become an important seaport. Brisbane, Rockhampton, and Townsville are the starting-points of three lines of railway which have been laid westwards for a distance of from 400 to 600 miles into the better parts of the tableland. The harbours of Bowen and Gladstone are naturally two of the best on the coast. The coast towns as far north as Cairns are linked with Brisbane by rail and it has long been planned to join Darwin with Cloncurry and so with the whole Australian system. A good motor road, however, was eventually built instead during the Second World War.

South Australia does not answer to its name, though the name is somewhat more appropriate since the separation of the Northern Territory. It was founded in 1834 by an Act of the British Parliament, and was then expected ultimately to include the territory belonging to Victoria. Most of the inhabitants of the state are confined to a district about the size of England, chiefly the part of the state that receives a minimum of 10 inches of rain per annum, chiefly in winter. This district lies mainly to the east and west of Spencer Gulf and the Gulf of St. Vincent, where it is traversed by the Mount Lofty Range and the Flinders Range of mountains. Among agricultural products wheat is the most important. The sheltered slopes of the Mount Lofty Range are well suited to the vine and the state produces three-quarters of Australia's wine. From an early date copper was its chief mineral, but the excellent iron ore obtained from Iron Knob, Magnet Mountain, and elsewhere is now the most valuable. Irrigation is practised in the drier parts of the state, especially in the lower part of the Murray basin. At Renmark similar irrigation works to those of Mildura in Victoria have been

carried out, and there is a large production of fruit (for sale fresh, for canning and drying). The extension of sheep runs—the production of wool is of great importance—and stock rearing has been made possible over some of the drier areas by the use of water, for watering the animals, from artesian wells. The north-east of the state lies in the Great Basin. The land round Lake Eyre (38 feet below sea-level) is the lowest-lying part of Australia. Most of this 'lake' is now dry except for swamps at the southern end. Further north the telegraph line passes through many well-grassed regions which may some day be settled, and other grassy tracts are now known to border some of the river courses of this region. Little settlement, however, resulted from the construction of the railway to Oodnadatta. In 1931 this line was extended to the more promising grassland around Stuart (Alice Springs) in the Northern Territory, and later a connection was made by motor road with Darwin.

The capital of the state is Adelaide, situated near the east side of the Gulf of St. Vincent. It was founded in 1837 and named after the queen-consort of William IV and laid out on spacious lines which embody many of the principles of modern town-planning. About seven miles from the city stands Port Adelaide, on a small inlet opening out of the Gulf of St. Vincent. An outer harbour with a depth of 30 feet, opened at this port in January 1908, first provided accommodation for large ocean steamers. From the completion, in 1887, of the series of railways from Adelaide to Melbourne and Sydney, the port of Adelaide became the place at which all the mails were collected and landed by vessels following the south coast route; but was displaced by Fremantle after the opening of the trans-continental line from Port Augusta in South Australia to Kalgoorlie in Western Australia, a line which, along with various state lines, completes a through rail connection between Brisbane on the east and Fremantle on the west. Much of the mail landed at Fremantle is now taken by air to the eastern states, while the direct air mail from Europe comes *via* Darwin. Burra Burra, about one hundred miles north of Adelaide, was the seat of the chief inland copper-mines, but the principal copper-mines in the colony were those of Moonta, on the peninsula between Spencer and St. Vincent Gulfs. As to Iron Knob see p. 848. Port Augusta is a wheat-port at the head, Port Pirie another on the east side, of Spencer Gulf, and Port Lincoln a third, near the south end of Eyre's Peninsula.

Western Australia is the largest but the least populous of the older states. The vast deserts belonging to it will always cause it to be more imposing in extent than population, and even in the principal settled area, the district in the south-west, which receives autumn and winter rains brought by the north-west winds, corresponding to the south-west winds of Western Europe, the population is still

sparse. This is largely owing to the character of the country. Though there is much good soil, the fertile districts are scattered, and the best land for European settlers is far from what was, till the construction of the excellent harbour of Fremantle, the only good harbour of the settled district, that of King George's Sound. After the development of the gold-fields, however, population rapidly increased, and all the industries for which the state offers advantages, including agriculture, were stimulated. Thus the wheat acreage increased from 34,000 in 1890-91 to 1.7m. in 1915-16—a war-time maximum. It is now normally over 3m. Fine hard timber from the moist south-west has always been an important product of this state. The most productive gold-fields are those of Kalgoorlie in about 31° S., but so far in the interior that the industry was at first greatly hindered by the lack of water. A plentiful supply has, since January 1903, been pumped from a reservoir about 25 miles from Perth at a distance of 350 miles from Kalgoorlie. Before the discovery of the Coolgardie gold-field in 1891 the population of Western Australia did not exceed 50,000. The other gold-fields of the state have never been great producers. In the south-west of the state on the Collie River are important deposits of coal, which is exported from Bunbury, a place of export also for the hard timber of the state. In the northern parts of Western Australia pearl-fisheries have long been carried on along the coast, but this industry was threatened by the legislation of the Australian Commonwealth against the employment of coloured labour. It was adversely affected by the cultured pearls of Japan. Gold also exists in the interior of this part of Western Australia, and good pasture-lands have attracted a few settlers. The chief pastures are in Kimberley District, along the banks of the Fitzroy River, which flows into King Sound, about $17\frac{1}{2}^{\circ}$ S. This is cattle-ranch country but development is hampered by lack of communications. The cattle deteriorate greatly as they are driven on foot great distances to the ports. Oil prospects are hopeful but have still to be proved (p. 848). The capital of the state is Perth, on the Swan River, about twelve miles above its port, Fremantle, on the west coast. Albany, on King George's Sound, 260 miles from Perth, is where the first settlement was made on West Australian territory (in 1826).

Tasmania. This state consists of the island so called, together with the smaller islands adjacent. It is separated from Victoria by Bass Strait. Like Victoria and Queensland, the state was originally a dependency of New South Wales, and the first settlement upon it was a convict establishment formed in 1803, but it was made independent in 1825. The surface of the main island is in great part high. A bleak tableland, from 2,000 to 3,000 feet in height, occupies the middle and a large part of the western half of the island, and is crowned by mountains, and cleft by deep chasms through which issue

the torrents which come to form the rivers of the west coast. To the east of this tableland lies a tolerably level and open district, which forms the great grazing-ground of the state. Elsewhere the colonists have had to contend with land more or less heavily timbered. The climate is somewhat warmer than that of England, very suitable for all English crops, and specially well adapted for fruits. Copper (at Mount Lyell in the west), silver-lead (at Mount Zeehan), tin (at Mount Bischoff in the north-west and elsewhere), and gold are important minerals, and coal-mines and oil-shale (the latter near Latrobe in the north) are also worked. The capital is Hobart, at the end of the island furthest from Australia, an inconvenience which is, however, outweighed by the excellence of its harbour, formed by the estuary of the Derwent. The electric power that is available has enabled several important industries to be worked such as carbide manufacture, woollen goods, &c. One of the largest electrolytic zinc treatment works in the world, at Risdon, near Hobart, treats ores sent there from other states on the mainland in addition to those from Tasmania itself. These ores, being zinc-blende, contain sulphur which is used in the manufacture of sulphuric acid, and that again in converting Nauru phosphates into super-phosphates. The waters of the Great Lake and other catchment areas on the Central Plateau are used for generating power. Launceston is at the head of navigation on the Tamar, forty miles from the mouth of the estuary known as Port Dalrymple, on the side nearest to Australia. A deep-water port has been formed at Bell Bay on the Tamar.

The Northern Territory of Australia, embracing more than half a million square miles, was separated from South Australia and transferred to the Commonwealth on January 1, 1911. In 1927 the Northern Territory was divided into North Australia (centre at Darwin) and Central Australia (centre Alice Springs), but from 1931 the whole was placed again under one administrator at Darwin. Its southern limit being lat. 26° S., by far the greater part of the area lies within the tropics. It is only in the peninsular portion to the north that there is a copious rainfall—40 inches and upwards per annum, occurring, of course, almost entirely in summer, so that conditions here resemble the 'monsoon lands' of Peninsular India. Towards the interior, here as elsewhere in Australia, the precipitation becomes very scanty, the area with as much as 20 inches of rain annually not apparently extending beyond 18° S. The part with good rains should be well adapted for the growth of the vegetable products of the tropics, but the rainfall tends to be unreliable and soils would appear often to be naturally poor. Can whites be attracted to such marginal lands? The livestock industry is at present the only one of any importance, cattle being, as in the corresponding latitude of Queensland, the animals most largely reared.

Towards the south of the Territory are some well-grassed stretches, suitable for sheep, bordering the Finke and other rivers descending from the Macdonnell Ranges (on the Tropic of Capricorn) now accessible from railhead at Alice Springs, some 200 miles within the Territory, terminus of a narrow-gauge line from Adelaide. In the north, a similar line runs south from the coast at Darwin, the capital, to Birdum (316 miles), about 60 miles north of Daly Waters. Birdum and Alice Springs, 640 miles apart, are linked by Stuart Highway, a wartime enterprise. Another highway connects with Queensland in lieu of a railway (see p. 855). During the First World War meat-preserving works were erected near Darwin, but the cattle-rearers find it easier to send their stock overland to Queensland or to Wyndham in Western Australia. Darwin has half the Territory's total estimated population of 16,000.

CHIEF AUSTRALIAN TOWNS: ESTIMATED POPULATIONS 1951-52.

Sydney	1,621,000	Hobart	91,000	Toowoomba	39,000
Melbourne	1,393,000	Wollongong	79,000	Rockhampton	37,500
Adelaide	469,000	(N.S.W.)		Townsville	37,000
Brisbane	459,000	Launceston	50,000	Ipswich	35,000
Perth ¹	346,000	Geelong	48,000	Bendigo	32,000
Newcastle	136,000	Ballarat	43,000	Broken Hill	32,000

¹ Metropolitan District; includes Fremantle, 30,500.

DOMINION OF NEW ZEALAND

New Zealand, a British colony first settled in 1840, and proclaimed a Dominion in September 1907, consists mainly of two large islands situated about 1,200 miles south-east of Australia. Long and mostly narrow, they lie tandem-wise along a curve extending from north to south-west for over 1,000 miles. They are known simply as the North Island (a little smaller than England) and the South Island (a little larger than England), and support a population of nearly 2m., almost wholly of British descent. Cook's Strait, which separates them, is not quite so wide at its narrowest as the Straits of Dover. An interesting tail-piece is Stewart Island, famous for its oyster-fisheries, lying to the south of the South Island, from which it is separated by Foveaux Strait; it is about half the size of Cornwall.

Besides these main islands, the Dominion of New Zealand comprises several groups of small islands in the Pacific Ocean. Some of them, like the Chatham Islands to the east and the uninhabited Auckland Islands to the south, are within the official limits of the Dominion; others are dependent territories lying far to the north and east, in some cases as much as 2,000 miles away. In the latter category are the important Cook Islands, Niue, the Tokelau or

Union Islands, and the Kermadec group. New Zealand also includes within her sphere the Ross Sector of the Antarctic regions, to the south of the Dominion, as well as the Trust Territory of Western Samoa, while it shares with the United Kingdom and Australia responsibility for administering a second Trust Territory—the phosphate island of Nauru, just below the equator.

The coastline of New Zealand is in most places high and rocky, especially on the west coast. In the extreme south-west it is broken up by numerous inlets with very steep and lofty cliffy shores, resembling the fiords of Norway. Almost the whole surface of the Dominion is mountainous. One long succession of mountains runs through both the main islands. Less than a quarter of the total area is below 650 feet in elevation, and nearly two-thirds is between 650 feet and 3,500 feet; in the still higher ground are many mountains rising above 10,000 feet. The North Island is characterised by its volcanoes, both active and extinct, with which are associated innumerable hot springs and geysers. In the South Island the mountains lie for the most part close by the west coast, and it is about the middle of this island that the highest parts of the whole series are found. These parts are called the Southern Alps, and, like the Alps of Europe, they are crowned by perpetual snow, and have their higher valleys filled with large glaciers, their lower valleys occupied by large and picturesque lakes. So difficult are these mountains to cross, that for more than a hundred miles there is no road connecting the east and west coasts of the South Island. The West Coast Road between Christchurch and Hokitika passed through a difficult defile known as the Otira Gorge, and across Arthur's Pass, more than 3,000 feet high, but this road has, since 1923, been largely replaced by a railway with gradients of 1 in 33 passing under Arthur's Pass in a tunnel (the Otira or Arthur's Pass Tunnel) 5.3 miles long, rising from 1,585 feet at its western to 2,435 feet at its eastern end.

The most extensive plains in New Zealand are the Canterbury Plains, which occupy the middle of the South Island on the eastern side, extending for upwards of a hundred miles from north to south, with a varying breadth. Rivers in both islands are numerous, but the longer ones are for the most part unfit for navigation. Those of the South Island are mostly rapid torrents, fed in summer by the melting snows and glaciers of the Southern Alps. The longest, the Molyneux or Clutha (210 miles; the length of the Thames), is a noble stream, draining south-eastwards three of the chief lakes at the base of the Southern Alps. In the North Island, the chief navigable river is the Waikato (220 miles; the length of the Severn), which drains the largest lake in the Dominion, Lake Taupo (238 square miles), and enters the sea on the west coast.

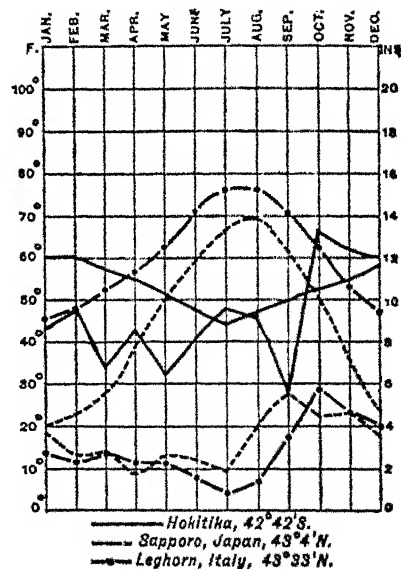
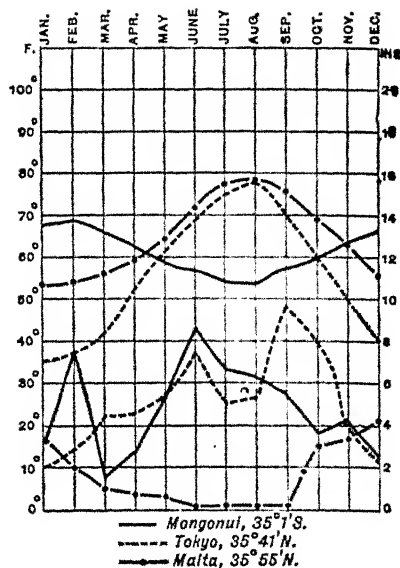
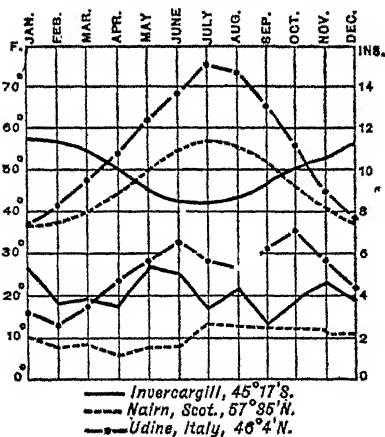
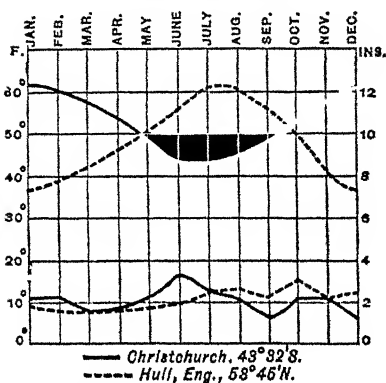
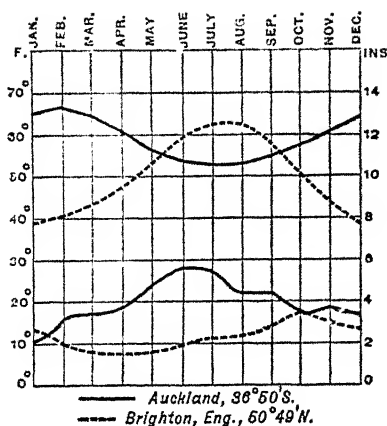
Half the total area of the Dominion is classed as arable or

pasture land, but only a small share of this is arable land—less than 4 per cent. of the total, against 46 per cent. pastures. Even of the 4 per cent. arable (2½m. acres) only half is under crops, most of the other half being in use as temporary meadows. Forests and woodlands cover a quarter of the Dominion, and the remaining fourth is classed as built-on, waste, &c.

The climate of New Zealand is not characterised by the liability to droughts from which so much of Australia suffers. The winds that carry the most plentiful rains blow from the north-west, as in the south-west of Australia, so that the western slopes of the mountains and the plains at their base are plentifully supplied with rain, whereas the plains on the east have a much smaller rainfall. Hence the forests are chiefly on the west side of the mountains, and the Canterbury Plains on the east are the chief pastoral and agricultural region in the Dominion. For the same reason the mountains form a rough and ready division between the sheep and cattle areas. Although there is much overlapping, the main sheep country lies to the east of the mountains, the wetter cattle country to the west. This division results in a preponderance of sheep farms in the South Island, where, as already noted, the mountains are close to the west coast, and in roughly equal areas for sheep and cattle in the North Island, where the mountains are central.

The temperature, especially in summer, resembles that of England more than that of Italy, with which New Zealand corresponds in latitude. (See diagrams, overleaf.) The New Zealand crops, therefore, are similar to those of England. Grapes are grown in the open air in the northern districts, but wine is rarely made from them. Wheat and oats are the chief corn crops, rivalling one another in total acreage; but much of the oats is cut for chaff or fed-off, comparatively little being threshed, while the area under wheat has tended to decline since the war. On the other hand there has been a notable increase in the acreage and production of barley. In spite of the small proportion of arable land, New Zealand is practically self-supporting agriculturally; imports of foodstuffs are negligible, apart from tropical products and wheat. The high average yield of wheat in New Zealand is shown on p. 126; but it is the pastoral industry which predominates. The more abundant rain of New Zealand causes the pastures to be richer than those of Australia, and English cultivated grasses thrive remarkably well. Indeed, the area under sown grasses is nine times that of all crops combined. A further interesting illustration of the resemblance between the climate of New Zealand and that of England is presented by the success with which the various breeds of English sheep are reared on the New Zealand pastures.

Wool became the staple export at an early stage, and though its fortunes have suffered from time to time it is still in the forefront of



METEOROLOGICAL DATA OF STATIONS IN NEW ZEALAND, compared with data for stations (a) in Great Britain, (b) others in corresponding latitudes in the Northern Hemisphere.

Mean temperature curves above, rainfall below.
Degrees F. numbered on left, inches of rainfall on right.

the Dominion's exports. But it was the development of refrigeration, making it possible to transport foodstuffs long distances through the tropics, that gave New Zealand its present-day economy. The first cargo of frozen meat was dispatched in 1882. As the trade in mutton increased, a change took place in the breeds of sheep employed, and to-day it is the dual-purpose, cross-bred animals, giving both good wool and good meat, that are characteristic of New Zealand. Some 10m. sheep of distinctive breeds are classified, more than half of them being Romneys; but New Zealand has over 30m. sheep, and the other 20m. or more are lumped together as 'flock-sheep'—cross-breds and others not specially enumerated.

More important still, the advent of refrigeration laid the foundations of the present-day large-scale dairy farming industry, with its emphasis on high-grade butter and cheese, which together have an export value two-thirds that of wool and nearly double that of meat.

As these changes took place, the large farms tended to become split up, and New Zealand has since developed as a country of small and medium-sized farms. The few large holdings that remain are devoted to sheep raised for wool only and are found mainly in the high country. Freezing works for lamb and mutton are the largest industrial plants in the Dominion, which is the world's largest exporter of this meat and takes fourth place among wool-producing countries. New Zealand is also the largest exporter of dairy produce, and this industry owes much of its economic success to the fact that most of the 5m. cattle can be grazed on open pastures the whole year round, with only a limited reliance on fodder. The butter and cheese factories are operated on a co-operative ownership system. Pig farming has not reached a big scale but is on the increase, as is the raising of stock for chilled beef.

The minerals of New Zealand are of minor importance, the chief being gold and coal. In the 1860s and again at the turn of the century gold-mining was a booming industry, but it has long since fallen off. The value of the gold mined in 1951 was well under £1m.; South Island was responsible for all of it. The production of coal, which is found in limited areas in both islands, amounted to nearly 2½m. tons in 1951; this does not meet local needs, and the balance comes from Australia. Iron ore is present in two areas, but exploitation has so far been on a small scale. Kauri-gum, the fossilised resin of former kauri forests, was formerly of considerable value.

The high relief and plentiful rainfall have made the development of water-power an easy matter throughout the country, and hydro-electric installations provide over 95 per cent. of the total electric power generated by public utilities. In the third decade of the twentieth century 54,000 h.p. had been developed; in the following decade this figure increased to 329,000 h.p., while at the end of

the half-century it was close on a million h.p. and the annual production of energy was over 3,000m. kwh. Plans for considerable further extensions are constantly being made; it is estimated that a total capacity of 4½m. h.p. is practicable, 80 per cent. of it in the South Island. The importance of these developments was responsible in 1945 for the establishment of a State Hydro-electric Department. The principal source of power in the North Island is the Waikato river; in the South Island the Waikiti river. The pioneer Lake Coleridge scheme, begun in 1911 to serve Christchurch and the Canterbury province, has since been extended and remains of great importance. The power schemes on each island are interconnected on a grid system.

The natives of New Zealand, called the Maori, are the most intelligent of all the natives whom the Europeans encountered in Australasia. They are a brown-skinned, well-formed people, fond of tattooing themselves. Most of them live on the North Island. Their number, formerly decreasing, increased from 82,000 in 1936 to 114,000 at the 1951 census.

Despite its dependence on pastoral industry, rather more than half the 2m. people of New Zealand live in 'urban areas,' and rather more than a third in the four principal cities: Wellington and Auckland in the North Island, Christchurch and Dunedin in the South Island. None of the other towns can compare with these four, or has more than about 30,000 inhabitants—though their importance is not to be gauged by numbers only.

The capital of the Dominion is wind-swept Wellington, in the south of the North Island, on the slopes of an inlet from Cook Strait, forming a safe and commodious harbour (Port Nicholson) with depths alongside the wharves of from 16 to 41 feet. Auckland, on a narrow isthmus (six miles wide) at the base of the long north-western peninsula of the North Island, is the largest city and the foremost commercially; it was once the seat of government. It is a calling-station for steamers from San Francisco and the Panama Canal to Sydney, and as it lies on the east side of the isthmus (the west side having only a shallow harbour), vessels from Auckland bound for Sydney have to sail round the northern end of the island. Auckland is also the principal airport. Other noteworthy, though much smaller, centres in the North Island include Napier, on Hawke's Bay, outlet for an extensive farming district back of the east coast; New Plymouth, on the opposite side of the island, focus of the Taranaki dairy farms; Wanganui, also on the west coast, at the mouth of the Wanganui river, a centre of education and art; and inland, Palmerston North, hub of the Manawatu sheep and dairy farms, and Hamilton, capital of the Waikato dairying district.

In the South Island the chief towns are Christchurch and Dunedin. Christchurch is the principal town on the Canterbury Plains.

It is situated a few miles from the east coast, and separated by a tunnelled hill from its port, Lyttelton, situated on one of the inlets of Banks Peninsula. Dunedin, further south, is the port for the old province of Otago and stands at the head of the long Otago Harbour. Large ocean-vessels have to stop at Port Chalmers, half-way along the inlet. Invercargill is the chief town on Foveaux Strait; its port, for large vessels, is Bluff Harbour. Greymouth and Westport are the ports of the principal New Zealand coal-fields, on the west side of the South Island. The coal obtained from the Brunner mine and dispatched from Greymouth is of high quality.

The trade returns show that New Zealand's exports derive essentially from her farming industry—wool and mutton from her sheep; butter and cheese from her cattle. Two-thirds of the exports go to the mother country and over half the imports come therefrom; there has been a preferential tariff in favour of the United Kingdom since 1903. In 1950, imports were valued at £NZ.158m., and exports at £NZ.181m. The £NZ. is now equivalent to the £ sterling.

LEADING CITIES (CENSUS 1951)

Auckland	.	.	329,000	Christchurch	.	.	174,000
Wellington	.	.	133,000	Dunedin	.	.	95,000

THE PACIFIC ISLANDS

BRITISH TERRITORIES

FIJI, the premier British Crown Colony in the Pacific, is a group composed mainly of heavily wooded and volcanic islands situated more than a thousand miles to the north of New Zealand. The total land area of just over 7,000 square miles (nearly the size of Wales) is divided among more than 250 islands, most of them quite small and uninhabited; but Viti Levu, the largest of them, embraces more than half the land surface, and Vanua Levu, the second largest, occupies two-thirds of the remainder. The islands were ceded to Britain in 1874 by their native king, but even before that time people of European origin had established plantations of tropical crops. Plantation sugar was introduced soon after the beginning of British rule, and the Indian labourers who were brought to Fiji to work on the plantations have multiplied to such an extent that they now outnumber the native Fijians. Sugar has become the principal export, producing well over 100,000 tons annually. Also important, both as items of trade and for local consumption, are copra and coconut oil, bananas and pineapples. More recently gold-mining has developed, and gold now rivals copra for second place in the

Colony's exports, which in 1950 were valued at nearly £8m. (sugar, £3½m.; coconut products, £1½m.; gold, nearly £1½m.).

The chief towns of the group are seaports with fine harbours protected by coral reefs. The capital is Suva (population 25,000) in the south-east of Viti Levu. Next in importance are Lautoka, on the north coast, and Levuka, the former capital, on a small island to the east of Viti Levu. Fiji is also an important centre of Pacific air communications. The estimated population of the group in 1950 was 294,000, including 6,500 Europeans. The Fijians (130,000) are an intelligent and advanced people; together with the Indians (138,000) they share in all aspects of business, professional, and political life. The island of Rotuma, to the north of the group, is a dependency of the Colony.

Fiji has its own administration and Governor. All the remaining British island territories in the Pacific, a description of which follows, are administered under the jurisdiction of the High Commissioner for the Western Pacific, whose headquarters are at Honiara, in the Solomon Islands.

THE BRITISH SOLOMON ISLANDS PROTECTORATE includes all the Solomon Islands except the most northerly, which lie within Australia's trust territory of New Guinea. Separated from Australia by the Coral Sea and dispersed over a quarter of a million square miles of ocean, the Protectorate has a land area of about 11,000 square miles (roughly the size of Belgium), with a population of 98,000 natives (mostly Melanesians) and a few hundred Europeans. The islands are largely of volcanic origin, mountainous and forested. Guadalcanal, the biggest, has an area of 2,500 square miles, and three others (Ysabel, Malaita, and San Cristoval) are each in excess of a thousand square miles. Economically the group has been only partially exploited, and primitive conditions still widely obtain, the Missions playing an active part in the welfare work of the communities. Some of the islands saw fierce and destructive fighting in the Second World War and the work of reconstruction has been going on ever since. Trading is on a modest scale, the principal export being copra, with timber and gold well behind; in 1950 the value of the exports was less than £1m. The capital is Honiara, on Guadalcanal. The outlying Santa Cruz Islands are included within the Protectorate.

THE NEW HEBRIDES are a condominium jointly administered by Britain and France. Like the Solomons to the north-west they are volcanic and mountainous, and the native people, numbering 45,000, are Melanesians. But in total land area (under 6,000 square miles) the group is only about half the size of the British Solomons. The largest islands are Espiritu Santo (1,500 square miles), Malekula (450), Eromanga (330), and Efate (300), and there are about 60 lesser islands. The fertile soil produces luxuriant vegetation and

encourages agricultural industry, which provides a large export of copra and small exports of cocoa and coffee, the whole being valued in 1950 at £1½m. Two-thirds of the small European population are French; the largest plantations are French-operated, and most of the exports go to France; Denmark takes the next largest share. The seat of administration is Vila, on the island of Efate in the centre of the group.

THE GILBERT AND ELLICE ISLANDS COLONY is an administrative unit formed by the five island territories and groups described below, spread out over 2m. square miles of ocean and crossed both by the equator and the international date line. With the single exception of Ocean Island, all the islands are low-lying atolls—each a ring of coral enclosing a lagoon and offering little opportunity for agricultural production. Their combined areas amount to barely 400 square miles, and more than half of this is contributed by Christmas Island, the largest atoll in the Pacific. The inhabitants eke out a sometimes precarious existence on the fruit of the coconut and pandanus palms, supplementing these staple foods with fish. Copra is produced for export.

The **Gilbert Islands**, forming the north-western part of the Colony, consist of 16 atolls with a land area of 114 square miles and 28,000 inhabitants (Micronesians). Periodic droughts add to the problems of supporting so dense a population, some of whom migrate annually to the copra plantations of the Line Islands. The headquarters of the Colony are on the island of Tarawa.

The **Ellice Islands**, to the south of the Gilberts, are nine in number, with a total area of only 9½ square miles and a population (Polynesian) of about 4,500.

Ocean Island is the westernmost outpost of the Colony and an important source of high-grade phosphate, which is worked by the British Phosphate Commissioners, more than 100,000 tons being produced annually. This isolated patch of land, less than 2½ square miles in extent, has a population of 2,000.

The **Phoenix Islands** lie well to the east and comprise eight atolls together making 11 square miles. Formerly uninhabited, they have been used since 1937 to take part of the surplus population of the Gilberts and now have just over a thousand people. Their remote situation has given them a new importance as landing grounds for aircraft on trans-Pacific flights, a fact which was responsible for an agreement in 1939 between Britain and the U.S.A. for joint control of two of the islands—Canton and Enderbury.

The **Northern Line Islands**, in the north-eastern part of the Colony, comprise the detached islands of Fanning (12½ square miles, Washington (3), and Christmas (223). Their population is only about 500, Christmas contributing a particularly small number (50), and some of the Gilbertese are being settled there. On

Fanning is established a station on the cable link between Canada and Fiji.

THE TONGA ISLANDS, also known as the Friendly Islands, lie 400 miles to the east of Fiji and constitute the only surviving independent kingdom in the Pacific, British protection being limited to foreign affairs and financial matters. The islands are in three groups or districts: Tongatabu in the south, Vavau in the north, and Ha'apai in between. The northern and southern groups are mostly volcanic and the centre group consists of atolls. All told there are more than 150 islands, with a combined area of 270 square miles. The Tongan people (who are not British as are, for example, the people of Fiji) number 45,000. About half the population live on the island of Tongatabu (100 square miles), where the capital, Nukualofa, is situated. They are a friendly and enlightened people, actively engaged in agriculture, which furnishes them with subsistence crops as well as copra and bananas for export. The value of the exports is about £1m.

PITCAIRN ISLAND, its area of 2 square miles making it barely larger than Gibraltar, is midway between America and Australia. Its scanty but hardy population of 134 are descended from the *Bounty* mutineers (who occupied the island in 1790) and engage in farming and fishing; they produce for export a small quantity of oranges and pineapples. The uninhabited islands of Henderson, Ducie, and Oeno (from 65 to 290 miles away) are annexed to Pitcairn.

AUSTRALIAN TERRITORIES

TERRITORY OF PAPUA AND NEW GUINEA. This single administrative unit combines two distinct regions with separate status: the Australian territory of Papua (south-eastern New Guinea) and the Trusteeship Territory of New Guinea (consisting of the former German possessions of north-eastern New Guinea, the Bismarck Archipelago and the northernmost Solomons). It may be noted that, including the western half—a remnant of the former Netherlands East Indies which has not yet been handed over to Indonesia—the island of New Guinea covers over 300,000 square miles and is the second largest island in the world (excluding the continents); it ranks next to Greenland. The portion administered by Australia is just over half the whole, and with the associated islands totals 183,500 square miles—twice the size of Great Britain. The population is nearly 1½m.

The surface of New Guinea is in many parts mountainous. The whole of the narrow south-eastern extremity (lying mostly in Papua) is traversed by chains of mountains, known as the Owen

Stanley Range, with peaks upwards of 13,000 feet high. Lying within the monsoon area, the whole island receives copious rains during about half the year, and, like other tropical countries with an abundant rainfall, is covered with dense forests, which are one of the chief causes why the interior remained so long unexplored. Two great navigable rivers serve as highways into the interior. One of these, the Fly, forms a large delta on the western side of the Gulf of Papua; the other, the Sepik, enters the sea near the middle of the north-eastern coastline. Neither of these rivers, however, served as the means of gaining much knowledge of the land beyond its banks; the exploration for minerals, often with the help of the aeroplane, has been necessary for that, and even to-day the full mineral resources of the island have not been adequately prospected.

The food-plants which are grown are mainly such as require but little cultivation—bananas, yams, sago, sugar-cane, coconuts, and taro. Trade is not on a large scale; the chief exports are copra, gold, rubber, and pearl-shell. Alluvial gold-fields are worked by Europeans and some petroleum is produced. The seat of administration of the combined territories is at Port Moresby, which lies to the east of the Gulf of Papua, sheltered behind a long barrier reef that skirts the whole of this part of the coast, access to it being obtained by one of the numerous deep channels by which this reef, like the Great Barrier Reef of the neighbouring coast of Australia, is crossed.

For convenience, the somewhat complex composition of the combined Territory of Papua and New Guinea is summarised below in its separate components.

Papua has an area of 90,500 square miles and a population of about 370,000. Copra, rubber, and gold are exported to the value of about £A.1½m. The islands forming part of the territory include the d'Entrecasteaux and Louisiade groups and have an area of nearly 3,000 square miles.

North-eastern New Guinea, with its associated islands, covers 93,000 square miles of land, of which about 70,000 square miles is mainland territory. The population is about 1m. The value of the exports amounts to about £A.4½m., of which the principal items are for copra and gold. The largely undeveloped Bismarck Archipelago contributes 19,200 square miles to the total area and includes New Britain (14,600 square miles), New Ireland (3,340 square miles), Lavongai (460 square miles), and the Admiralty Islands (800 square miles); the population is about 130,000. The fine port of Rabaul, on New Britain, was formerly the seat of administration of the whole territory of north-eastern New Guinea; destroyed in the Second World War, it is now being reconstructed. The principal Solomon Islands included in the territory are Bougainville (3,880 square miles) and Buka (220 square miles).

NAURU,¹ an island of 8 square miles just south of the equator, was formerly held by Germany and is now a trusteeship territory for which Great Britain, Australia, and New Zealand are jointly responsible, the functions of administration being in fact exercised by Australia by common consent. Like Ocean Island, in the Gilbert and Ellice Islands Colony, Nauru is important for its deposits of high-grade phosphate, rights in which are vested in the British Phosphate Commissioners. About a million tons of phosphates are exported annually. A third of the population of 3,400 are Chinese.

NORFOLK ISLAND (13 square miles), with a population of about 1,000, is over 900 miles to the north-east of Sydney and is administered by the Commonwealth Government. The products are fruit and coffee.

LORD HOWE ISLAND (5 square miles), lies midway between Sydney and Norfolk Island and is a dependency of New South Wales. It exports seeds of the kentia palm and has a population of fewer than 200.

NEW ZEALAND TERRITORIES

THE COOK ISLANDS, lying in the central Pacific 1,600 miles from New Zealand, have a total land area of about 100 square miles and a population of more than 15,000. The 15 islands of which they are composed are in two groups, Lower and Northern, the former being the more extensive and containing the main island of Rarotonga (26 square miles). The exports, amounting to about a quarter of a million pounds, consist of citrus fruits, copra, pearl-shell, and tomatoes, the trade being mostly with New Zealand.

NIUE, or Savage Island, 600 miles west of Rarotonga, is an outlier of the Cook group but is separately administered. It is 100 square miles in area and has a population of about 4,500. There are small exports of bananas and copra.

THE KERMADEC ISLANDS (13 square miles), 600 miles to the north of New Zealand, have a meteorological and radio station and fewer than a score of inhabitants.

THE TOKELAU ISLANDS, or Union Islands, over 3,000 miles from New Zealand and half-way to Hawaii, are a group of three atolls with 4 square miles of land and 1,500 people.

WESTERN SAMOA, which New Zealand administers as a United Nations trusteeship territory, consists principally of two large islands—Suvaii (703 square miles) and Upolu (430 square miles)—lying a few hundred miles nearer to New Zealand than the Tokelaus. The islands are mountainous and fertile, and Upolu contains the harbour of Apia. There are about 80,000 people and

the Samoan population is on the increase. Copra, cocoa, and bananas are produced and exported to the value of about £1½m.

FRENCH TERRITORIES

NEW CALEDONIA and its dependencies form one of the overseas territories of France. They lie between the New Hebrides and the coast of Queensland, from which they are distant about 700 miles. Cigar-shaped and mountainous, the main island is about 250 miles long and 30 miles broad; estimates of its area differ surprisingly—from 6,200 square miles to 8,500 square miles. The climate is favourable for European settlement and nearly a third of the population of 61,000 are French. The native Melanesians form half the total, but their decline in number is shown by once-cultivated terraces that now lie abandoned. Coconuts (copra) and coffee are the main agricultural products for export, other crops being bananas, yams, manioc, taro, maize, wheat, rice, and sweet potatoes. Large areas of savanna assist the pastoral industry, and there are over 90,000 head of cattle. But it is its great wealth of mineral resources for which New Caledonia is chiefly remarkable. The island is the world's second source of nickel (Canada, 90 per cent.; New Caledonia, 5 per cent.), as well as an important source of chromium. Iron ore and manganese are plentiful, and several other metals are found, but competition and distance from consumers hinder development. The exports in 1950 were valued at nearly £3m. The dependencies include a variety of smaller islands and groups, some near and others distant: in all, adding about 1,000 square miles to the area of the territory and 8,000 to the number of inhabitants. Among them are the Loyalty Islands, 60 miles to the east, the Wallis Archipelago, 1,300 miles to the north-east, and the Chesterfield Islands, 350 miles to the west.

The capital of the territory is Noumea (population 11,000), on a fine harbour in the south-west of New Caledonia. It is the seat of the South Pacific Commission, an international advisory body formed in 1947 to promote the economic and social welfare of the island peoples. The members of the Commission are Britain, Australia, New Zealand, the United States, France, and the Netherlands, and a conference organisation has been established of which representatives of all the island territories are members.

FRENCH SETTLEMENTS IN OCEANIA is the title of the remaining French possessions in the Pacific area, forming a second overseas territory. The islands are widely dispersed over the eastern (Polynesian) Pacific, with a total land area of about 1,500 square miles and a population of 56,000. The main group is that of the

Society Islands, in which the chief island is Tahiti (600 square miles), containing the commercial centre and seat of administration, Papeete (population 12,500). It has a mountainous interior and a fertile littoral whereon tropical fruits flourish. Phosphates, copra, mother o' pearl, and vanilla provide exports to the value of over £2½m. Other groups included in the territory are the Marquesas Islands (450 square miles), the Tuamotu Group (76 atolls stretching for 1,000 miles), the Leeward Islands, the Austral and Rapa Group, and the Gambier Group.

UNITED STATES TERRITORIES

THE HAWAIIAN ISLANDS (formerly known in Britain as the Sandwich Islands) are an important group of volcanic islands in the North Pacific, belonging since 1898 to the United States. Over 2,000 miles south-west of California, they are conveniently placed on the trade and air routes across the Pacific. In total area they are a little smaller than the Fiji Islands, which they resemble in the nature of their products, but they have a population (500,000) nearly twice that of Fiji. Only 8 of the 24 islands are inhabited. Native Hawaiians and part-Hawaiians now constitute only 18 per cent. of the people; Japanese form the largest element (37 per cent.), and Caucasians contribute 16 per cent.; Filipinos and Chinese are also numerous. The largest island is Hawaii (4,030 square miles), on which the extinct volcano of Mauna Kea rises to a height of nearly 14,000 feet. Maui and Oahu (728 and 604 square miles respectively) are next in size.

About a third of the total area is pasture land, on which beef cattle and sheep are reared, and another fourth is forested. Only 7½ per cent. is under cultivation, but the crop yield is high because of the fertile soil and favourable climate. The emphasis is on export products, and most of the cultivated land is devoted to sugar and pineapple plantations, though coffee and bananas are also grown for export. In 1950 the production of raw sugar was nearly a million short tons (the American short ton of 2,000 lb.). Sugar refining and pineapple canning are chief among a number of manufacturing industries. Exports in 1947 were valued at \$236m., imports at \$350m. Later figures are not available; in 1948 the legal requirement of filing export declarations for shipments between the United States and Hawaii was abolished.

Much of the prosperity of the islands arises, however, from their popularity as holiday resorts. The capital, Honolulu, on the island of Oahu, is an important port of call, with nearly a quarter of a million inhabitants. Pearl Harbour, close by, is the headquarters

of the U.S. Pacific fleet, which also has establishments¹ on Midway, 1,300 miles to the west.

GUAM, in the north-west Pacific, is 1,500 miles east of Manila. Although it is the largest of the Marianne Islands it is under separate administration, having been an American possession since 1898. It has an area of just over 200 square miles and a population of 60,000, nearly half of whom are Guamanians. A variety of tropical crops is grown, but the importance of the island is as a strategic naval and air base.

AMERICAN SAMOA is not a trusteeship territory as is Western Samoa. It has been under American administration since 1899, when the Samoan Islands were divided between Germany and the United States, the interest of the latter being in the use of the great natural harbour of Pago Pago as a naval base. There are five islands, mountainous and forested, with a total area of 73 square miles and a population of 18,500, the main island of Tutuila (on which is Pago Pago) accounting for 72 per cent. of all the land and 85 per cent. of the people. Cultivation is almost entirely confined to coconuts, from which a small quantity of copra is produced for export.

NORTH PACIFIC TRUST TERRITORY. At the conclusion of the First World War, the German possessions in the North Pacific were placed under Japanese mandate. Following the Second World War they have become a United Nations trusteeship territory for which the United States has assumed responsibility. They cover an ocean area of 2½m. square miles and consist of over 2,000 islands and islets (of which 84 are inhabited), making a total land area of less than 700 square miles. The combined populations number 121,000, the indigenous inhabitants being Micronesians. The islands fall into three groups—the Marianne or Ladrone Islands, the Carolines, and the Marshalls. Copra, sugar-cane, and cotton are produced, and in the Carolines important deposits of bauxite and phosphate are worked. Atomic bomb experiments in the Marshalls have made famous the names of Bikini and Eniwetok.

NETHERLANDS TERRITORY

WESTERN NEW GUINEA, claimed by Indonesia but still retained by the Netherlands (see pp. 597 and 868), has an area of 150–160,000 square miles and an estimated population of 1m. It is largely mountainous, with peaks rising to 15,000 ft., and is still little developed, but oil has been located and is beginning to be exported. Other exports are mainly forest products.

APPENDIX

COUNTRIES OF THE WORLD BY CONTINENTS

AREAS AND POPULATIONS BASED ON THE UNITED NATIONS YEAR BOOK
OF FOOD AND AGRICULTURAL STATISTICS 1952 (1953)

Areas converted from hectares into square miles.

Populations mostly mid-year estimates, 1951

In the few cases where the areas in this table differ substantially from those in the text, the variation may be attributed to conflicting estimates, or to the inclusion or omission of disputed territories and/or outlying dependencies. The same considerations affect the estimates of population.

Country	Area: sq. miles	Popula- tion in thousands	Country	Area: sq. miles	Popula- tion in thousands
EUROPE			Europe (cont.)		
Albania . . .	11,100	1,200	Malta . . .	122	313
Andorra . . .	180	5	Netherlands . . .	13,530	10,264
Austria . . .	31,410	6,916	Norway . . .	125,180	3,294
Belgium . . .	11,780	8,678	Svalbard . . .	23,980	—
Bulgaria . . .	42,795	7,310	Poland . . .	120,360	24,977
Czechoslovakia . . .	48,830	12,340	Portugal . . .	34,390	8,606
Denmark . . .	16,575	4,304	Roumania . . .	91,650	16,200
Faeroes . . .	540	32	San Marino . . .	38	13
Finland . . .	130,120	4,050	Spain (with		
France . . .	212,975	42,239	Balearics) . . .	191,330	28,086
Saar . . .	990	954	Sweden . . .	173,440	7,073
Germany:			Switzerland . . .	15,950	4,749
Western . . .	94,310	48,117	Utd. Kingdom:		
Eastern . . .	41,380	17,540	England . . .	50,325	41,148
Berlin . . .	340	3,343	Wales . . .	8,015	2,597
	136,030	69,000	Scotland . . .	30,405	5,096
Gibraltar . . .	2	23			
Greece . . .	51,180	7,600	Gt. Britain . . .	88,745	48,841
Hungary . . .	35,910	9,390	N. Ireland . . .	5,470	1,371
Iceland . . .	39,960	145			
Ireland:			U.K. . .	94,215	50,212
Irish Republic . . .	27,135	2,959	Isle of Man . . .	220	55
N. Ireland . . .	5,470	1,371	Channel Is. . .	75	103
Italy . . .	116,240	46,598	Vatican City . . .	(109 acres)	1
Liechtenstein . . .	62	14	Yugoslavia . . .	99,180	16,340
Luxembourg . . .	1,000	299			
			Europe ¹ . . .	1,904,000	396,000

¹ Exclusive of U.S.S.R. in Europe, and Turkey in Europe.

Country	Area: sq. miles	Popula- tion in thousands	Country	Area: sq. miles	Popula- tion in thousands
ASIA			Asia (cont.)		
Aden	112,000	750	Philippines	115,710	20,246
Afghanistan	231,660	12,000	Qatar	8,500	17
Bahrain Is.	230	110	Ryukyu Is.	1,320	929
Bhutan	18,000	300	Saudi Arabia	597,000	6,000
British Borneo:			Syria	70,530	3,579
Brunei	2,230	47	Thailand	198,270	18,836
N. Borneo	29,390	335	Trucial Oman	6,000	76
Sarawak	47,070	571	Turkey	300,000	20,935
Burma	261,790	18,674	Yemen	75,000	4,500
Ceylon	25,330	7,742			
China	3,745,325	463,500	Asia¹	10,393,000	1,284,000
Formosa					
(Taiwan)	13,885	7,712	AFRICA		
Cyprus	3,570	491	Algeria	851,300	8,930
Hong Kong	390	2,013	Angola	481,350	4,130
India (exclusive			Basutoland	11,720	578
of Kashmir)	1,184,610	356,892	Bechuanaland		
Jammu and			Prot.	275,000	290
Kashmir	82,260	4,370	Belgian Congo	913,000	11,519
French India	195	337	(Ruanda-		
Portuguese „	1,535	639	Urundi)	20,920	3,835
Indo-China	246,260	30,000	Br. Somaliland	68,000	500
Indonesia	735,280	76,500	Canary Is.	1,900	800,000
Portuguese			Cape Verde Is.	1,560	150
Timor	7,330	450	Central Africa		
Iran	636,290	19,140	Fedn.:		
Iraq	171,600	5,100	S. Rhodesia	150,350	2,158
Israel	7,950	1,516	N. Rhodesia	288,125	1,947
Japan	142,270	84,300	Nyasaland	48,440	2,400
Jordan	35,180	1,320			
Korea	77,950	29,300		486,915	6,505
Kuwait	8,000	170	Egypt	386,100	20,729
Lebanon	4,010	1,285	Ethiopia	410,000	15,000
Macao	6	188	Eritrea	48,000	1,104
Malaya:			Fr. Cameroons	170,250	3,125
Federation	50,690	5,337	Fr. Equatorial		
Singapore (in-			Africa	980,100	4,484
cluding De-			Fr. Somaliland	9,000	55
pendencies	290	1,045	Fr. Togoland	21,200	1,014
Maldivé Is.	115	83	Fr. West Africa	1,819,120	17,208
Mongolian			Gambia	4,000	279
People's Re-			Gold Coast and		
public	625,950	885	Br. Togoland	91,850	4,333
Muscat and			Kenya	224,940	5,680
Oman	82,000	550	Liberia	43,000	1,648
Nepal	54,000	7,000	Libya	679,350	1,124
Pakistan			Madagascar	227,800	} 4,498
(exclusive of			Comoro Is.	840	
Kashmir)	376,975	75,842	Madeira	308	226,000

¹ Exclusive of U.S.S.R. in Asia and Netherlands New Guinea.

Country	Area: sq. miles	Popula- tion in thousands	Country	Area: sq. miles	Popula- tion in thousands
Africa (cont.)			N. and C. America (cont.)		
Mauritius with Dependencies	810	500	Leeward Is.	420	116
Morocco:			Trinidad and Tobago	1,980	649
French	150,890	8,500	Windward Is.	830	279
Spanish	17,710	1,226	Canada	3,845,800	14,009
Tangier	135	172	Costa Rica	19,610	825
Mozambique	297,740	5,781	Cuba	44,220	5,469
Nigeria and Br. Camerouns	373,250	26,000	Dominican Republic	19,130	2,167
Portuguese Guinea	13,950	517	El Salvador	13,180	1,920
Réunion	965	263	Greenland	840,000	23
St. Helena, and Dependencies	125	5	Guadeloupe	690	292
São Thomé and Príncipe	370	60	Guatemala	42,040	2,887
Seychelles	150	37	Haiti	10,715	3,112
Sierra Leone	29,930	1,891	Honduras	44,480	1,505
Somalia	193,000	1,247	Martinique	425	276
Spanish Guinea	10,830	175	Mexico	761,000	26,332
Spanish Sahara (Rio d'Oro)	106,150	81	Netherlands W. Indies	380	166
Sudan	967,500	8,740	Nicaragua	57,000	1,088
Swaziland	6,690	200	Panama	28,575	817
Tanganyika	362,690	7,827	Panama Canal Zone	550	42
Tunisia	60,170	3,500	Puerto Rico	3,425	2,254
Uganda	93,980	5,187	St. Pierre and Miquelon	95	5
Union of S. Africa	463,000	12,683	United States	3,022,350	154,353
South-West Africa	317,730	416	Alaska	586,500	140
Zanzibar and Pemba	1,020	272	Virgin Is. (U.S.)	130	27
Africa	11,691,000	202,000	N. and C. AMERICA	9,363,000	220,600
NORTH AND CENTRAL AMERICA			SOUTH AMERICA		
Bermuda	22	38	Argentina	1,084,400	17,644
Br. Honduras	8,870	70	Bolivia	412,800	3,054
British West Indies:			Brazil	3,288,000	53,377
Bahamas	4,400	81	Br. Guiana	83,000	437
Barbados	175	213	Chile	286,400	5,912
Jamaica	4,410	1,444	Colombia	439,830	11,266
Cayman Is.	95		Ecuador	106,000	3,203
Turks and Caicos Is.	200		Galapagos Is.	2,965	2
			Falkland Is.	6,070	30
			Fr. Guiana	34,750	1,425
			Paraguay	157,050	8,558
			Peru	482,260	

<i>Country</i>	<i>Area: sq. miles</i>	<i>Popula- tion in thousands</i>	<i>Country</i>	<i>Area: sq. miles</i>	<i>Popula- tion in thousands</i>
S. America (<i>cont.</i>)			Oceania (<i>cont.</i>)		
Surinam	55,140	223	New Guinea:		
Uruguay	72,175	2,400	Papua and	183,000	369
Venezuela	352,150	5,176	Australian		
			Trust		
			Netherlands		
S. America	6,865,000	112,700	Territory	159,375	1,020
			New Hebrides	5,700	49
			New Zealand	103,730	1,947
			Pacific Is.	260	22
OCEANIA			Pitcairn	2	—
Australia	2,974,540	8,478	Samoa:		
Norfolk Is.	13	1	West (N.Z.)	1,130	83
Br. Solomon Is.	11,500	101	American	80	19
Fiji	7,040	298	Tonga	265	49
Fr. Oceania	1,470	63	U.S. Trust Is.	690	56
Gilbert and					
Ellice Is.	375	39	Oceania¹	3,464,000	13,300
Guam	210	60			
Hawaii	6,410	500	U.S.S.R.	8,598,000	205,000
Nauru	8	3	WORLD		
New Caledonia	7,180	65	TOTAL	52,238,000	2,434,000

¹ Including Netherlands New Guinea.

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